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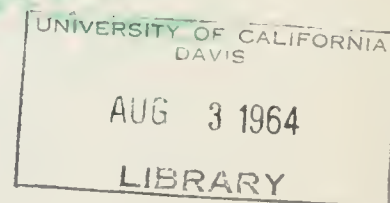


THE RESOURCES AGENCY OF CALIFORNIA
Department of Water Resources

BULLETIN No. 103

SAN LUIS OBISPO AND
SANTA BARBARA COUNTIES
LAND AND WATER USE SURVEY,
1959

JUNE 1964



HUGO FISHER
Administrator

The Resources Agency of California

EDMUND G. BROWN
Governor
State of California

WILLIAM E. WARNE
Director
Department of Water Resources







State of California
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J. E. WARNE
Director of
Resources

W. T. GOLDBERG
Deputy Director

W. C. PRICE
Director Policy

W. GARDNER
Deputy Director
Administration

W. R. GOLZE
Chief Engineer

EDMUND G. BROWN
GOVERNOR OF
CALIFORNIA

HUGO FISHER
ADMINISTRATOR
RESOURCES AGENCY

ADDRESS REPLY TO
P. O. Box 388
Sacramento 2, Calif.



THE RESOURCES AGENCY OF CALIFORNIA
DEPARTMENT OF WATER RESOURCES

1120 N. STREET, SACRAMENTO

February 13, 1964

Honorable Edmund G. Brown, Governor, and
Members of the Legislature of the
State of California

Gentlemen:

I am pleased to transmit herewith Department of Water Resources Bulletin No. 103, "San Luis Obispo and Santa Barbara Counties Land and Water Use Survey, 1959," which was prepared as a part of the department's continuing program of studies of the use of the water resources of the State, pursuant to Sections 225, 226, and 232 of the Water Code.

All of San Luis Obispo and Santa Barbara Counties, and small portions of Monterey, Ventura, and Kern Counties were surveyed during the investigation. Data on land use and estimates of water use for 1959 are presented in the report. Changes in land and water use since 1949, the year of the previous survey, are also evaluated.

During the 10-year period between 1949 and 1959, there was an increase of about 29 percent in the gross water service area, and the net water use in the area of investigation increased about 23 percent to approximately 206,000 acre-feet per season.

Projections based on these studies indicate that by 1980 the water use within the coastal portions of these two counties will exceed the safe yield of local water supplies, and that by the year 2020, the water use will increase about 187 percent over the 1959 level to a total of 591,000 acre-feet annually. This is about 221,000 acre-feet in excess of the safe yield of local water resources. This water supply deficiency must be made up by imported water if growth in this area is to continue.

Sincerely yours,

William E. Warner

Director

ACKNOWLEDGMENT

Valuable assistance and data used in this investigation and report were contributed by public and private agencies. Special mention is made of the cooperation received from the San Luis Obispo County Flood Control and Water Conservation District, and United States Department of Agriculture, Forest Service. The cooperation and assistance received from these agencies is gratefully acknowledged.

STATE OF CALIFORNIA
THE RESOURCES AGENCY OF CALIFORNIA
DEPARTMENT OF WATER RESOURCES

EDMUND G. BROWN, Governor
HUGO FISHER, Administrator, The Resources Agency
WILLIAM E. WARNE, Director, Department of Water Resources
ALFRED R. GOLZE', Chief Engineer
JOHN R. TEERINK, Assistant Chief Engineer

SOUTHERN DISTRICT

James J. Doody District Engineer
Herbert W. Greydanus Chief, Planning Branch

- - - - -

This bulletin was prepared in the
Water Supply and Utilization Section
under the direction of

Donald H. McKillop Chief, Water Supply and Utilization Section
and

Ronald G. Hansen Senior Engineer, W.R.
by

Thomas A. Sanson, Jr. Associate Engineer, W.R.
and

Elwood C. Johnson Engineering Associate, W.R.
assisted by

Barry P. Brown Assistant Land and Water Use Analyst
Robert D. Smith Assistant Land and Water Use Analyst
L. Eugene Fouquette Water Resources Technician II
Sumi Minatoya Delineator



CHAPTER I. INTRODUCTION

The population boom which has projected California into first place as the most populous state of the nation is nowhere more evident than in San Luis Obispo and Santa Barbara Counties where the population has increased at rates which exceed the statewide average. As a result, land use patterns in these two counties are undergoing substantial changes. Urbanization has been accelerated, replacing lands formerly devoted to agricultural crops, and additional lands have been brought into agricultural production to replace those lost to urbanization.

Although these changes in population and land use have brought about beneficial economic developments in San Luis Obispo and Santa Barbara Counties, they have also been accompanied by increased demands for water.

This report presents facts which point up the direction and magnitude of land use development and its subsequent effects on the demands or need for water in 1959. It is one of a series of bulletins presenting the results of studies conducted by the Department of Water Resources pursuant to legislative directive and contains the results of the land and water use survey conducted in San Luis Obispo and Santa Barbara Counties during the summer of 1959.

Land use information is gathered to obtain basic data from which present water requirements can be computed. Knowledge of historical and current patterns of land use not only permits such calculations but, of more importance to the overall planning concept, provides the data necessary to an analysis of the direction and magnitude of land use changes

taking place from one survey to another. This information, coupled with computations of changes in water requirements, provides a basis upon which future water requirements can be projected and upon which the planning for importation and distribution systems is carried out. The material presented herein is intended for the use of responsible agencies in making the most effective use of existing water supplies and in developing additional supplies to meet current or anticipated deficiencies.

Authorization

The California Legislature of 1929 enacted legislation providing for investigations of this kind as follows:

"Out of any money in the state treasury not otherwise appropriated, the sum of four hundred fifty thousand dollars,* or so much thereof as may be necessary, is hereby appropriated to be expended by the state department of public works in accordance with law in conducting work of exploration, investigation and preliminary plans in furtherance of a co-ordinated plan for the conservation, development and utilization of the water resources of California including the Santa Ana River and its tributaries, the Mojave river and its tributaries, and all other water resources of southern California." (California Statutes 1929, Chapter 832 Section 1).

*Reduced by the Governor to \$390,000.

Subsequent sessions of the Legislature have appropriated funds for support of the Department of Water Resources. Portions of these funds have been utilized for continuing investigations of the water resources of Southern California and the utilization thereof in accordance with the legislative intent expressed in the foregoing statute and in Sections 225 and 226 of the California Water Code.

In 1956, the Legislature further directed the Department of Water Resources to make continuing investigations to develop "information as to water which can be made available for exportation from the watershed

in which it originates without depriving those watersheds of water necessary for beneficial uses therein." This legislation specifically requested investigation of the following matters:

"(a) The boundaries of the respective watersheds of the State and the quantities of water originating therein; (b) The quantities of water reasonably required for ultimate beneficial use in the respective watersheds; (c) The quantities of water, if any, available for export from the respective watersheds; (d) The areas which can be served by the water available for export from each watershed; and (e) The present uses of water within each watershed together with the apparent claim of water right attaching thereto, excluding individual uses of water involving diversions of small quantities which, in the judgment of the Director of Water Resources, are insufficient in the aggregate to materially affect the quantitative determinations included in the report." (California Statutes 1956, First Extra Session, Chapter 61; Water Code Section 232.)

Pursuant to the foregoing legislation, the Department of Water Resources began a program of continuing surveys of land and water use in the water-deficient Southern California area during 1957. Surveys are made in portions of the entire Southern District, so that land and water use are determined at periodic intervals for every area within the district.

Scope of Investigation and Report

This report contains the results of a comprehensive survey of the nature and extent of land and water use in San Luis Obispo and Santa Barbara Counties and tributary drainage areas. The area of investigation is delineated on Plate 1, "Area of Investigation."

Present land use was determined from an extensive field survey conducted during the summer of 1959. This was supplemented by surveys at three-month intervals in several areas subject to multiple cropping to determine crop patterns and water use.

In addition to showing land use, this report presents a narration of historical land use development and an estimate of present levels

of net water use. Results of previous land use studies, conducted for State Water Resources Board Bulletin No. 2, "Water Utilization and Requirements of California," and State Water Resources Board Bulletin No. 18, "San Luis Obispo County Investigation," were utilized as the basis for comparison between historical and present land use determinations. Information on water supplies was obtained from material in the department's files and from information obtained from operating agencies in the area of investigation.

Terms used in this report, which require clarification, are defined where they first occur in the text, and are supplemented by a list of definitions presented in Appendix A.

Land use information collected by the Department of Water Resources is processed by machine techniques which permit the evaluation of this data in terms of a sizable number of hydrologic, geographic, and political subdivisions with different boundaries. The tabulations in the main body of this report give land use within the boundaries which are thought to be the most generally useful. Additional land use tabulations for hydrologic units and subunits are given in Appendix B. Appendix C contains a list of districts, areas, and units for which individual tabulations of 1959 land uses can be obtained by machine methods, based on data available in the department's files.

Related Investigations and Reports

The California Legislature, by Chapter 1541, Statutes of 1947, appropriated funds for predecessor agencies and the Department of Water Resources to conduct a comprehensive investigation of the water resources

of the entire State of California. The investigation had as its purpose the preparation of The California Water Plan. Results of the investigation are contained in three publications: California State Water Resources Board Bulletin No. 1, "Water Resources of California," 1951; California State Water Resources Board Bulletin No. 2, "Water Utilization and Requirements of California," June 1955; and California State Department of Water Resources Bulletin No. 3, "The California Water Plan," May 1957. The investigations for Bulletin No. 2 included surveys of land use and a determination of water utilization in San Luis Obispo and Santa Barbara Counties for conditions of 1949.

The following reports also contain information pertinent to land and water use within the investigational area:

California State Department of Finance. "Population of California's Areas and Counties in 1957." October 1957.

California State Department of Public Works, Division of Highways, Maintenance Department. "Tabulation Showing Population of California Cities and Towns." July 1957.

California State Water Resources Board. "San Luis Obispo County Investigation." Bulletin No. 18. May 1958.

California State Department of Water Resources. "Investigation of Alternative Aqueduct Systems to Serve Southern California." Bulletin No. 78. December 1959.

Santa Barbara County, Department of Agriculture. "Agricultural Crop Report." 1951, et. seq.

United States Department of Commerce, Bureau of the Census. "U.S. Census of Agriculture, Irrigation of Agricultural Lands, California." 1952.

----. "United States Census of Agriculture, 1954." July 1956.

United States Department of the Interior, Geological Survey. "Geology and Groundwater Resources of the Santa Maria Valley Area, California." Water Supply Paper 1000. 1951.

United States Department of the Interior, Geological Survey. "Geology and Water Resources of the Santa Ynez River Basin, Santa Barbara County, California." Water Supply Paper 1107. 1951.

----. "Geology and Ground Water Resources of the South Coastal Basins of Santa Barbara County, California." Water Supply Paper 1108. 1951.

United States Department of the Interior, Bureau of Reclamation.
"Reconnaissance Study of Water Problems of Southern Santa Barbara County, California." June 1955.

CHAPTER II. AREA OF INVESTIGATION

The area of this investigation encompasses the Counties of San Luis Obispo and Santa Barbara together with minor portions of the adjacent Counties of Monterey, Kern and Ventura. The general location of the area is presented on Plate 1 and is detailed on Plate 2, "Hydrologic Units, Sub-units and Major Water Agencies."

Location and Description

This investigation includes the lands lying west of the Temblor Range which separates the coastal areas from the San Joaquin Valley. Approximately 50 miles wide, the area extends northwestward from the Ventura-Santa Barbara County line to the Monterey-San Luis Obispo County line, a distance of approximately 130 miles. The survey area encompasses approximately 6,600 square miles and includes the minor portions of Monterey County which drain to the Salinas River, southerly of the Monterey County line. That portion of the Cuyama River drainage area located in Ventura County is also included in the area of investigation.

The survey area consists of numerous mountain ranges incised by long, narrow, alluvial river valleys which broaden as they approach the ocean. The rugged Santa Lucia Range, La Panza, Sierra Madre, San Rafael and Santa Ynez Mountains are among those which cross the area in a generally northwest-southeast direction. Valley areas include the Salinas, Arroyo Grande, Santa Maria, Cuyama, and Santa Ynez Valleys and the Carrizo Plain. Much of the valley land, particularly that located near the ocean, has been intensively developed for irrigated agriculture.

The climate in the coastal portion of the area is characterized by a long, warm, summer season with frequent coastal fog, followed by a



shorter wet winter period accompanied by cooler temperatures. The presence of the ocean has a moderating effect on the temperature in these areas and killing frosts are infrequent, so that in some areas it is possible to raise crops on a year-round basis. The coastal area from Carpinteria to Pismo Beach is so favorable climatically that almost all of the citrus and subtropicals in San Luis Obispo and Santa Barbara Counties are grown here. Average temperatures along the coast are around 55 to 60 degrees.

The climate becomes more variable as the distance from the ocean increases. Further inland, warm summers and somewhat cooler winters are found; during the winter, temperatures below freezing are common in these inland areas. However, the summers are sufficiently long to provide an adequate growing season for a wide range of agricultural crops.

Precipitation characteristically occurs as rainfall, although snowfall in limited amounts often falls at higher elevations in the mountains. Depth of rainfall generally increases with elevation. The City of Santa Barbara, at an elevation of 116 feet, experienced a mean seasonal precipitation of 18.6 inches for the 50-year period 1897-98 through 1946-47, but at San Marcos Pass, 8 miles distant, at an elevation of 2,800 feet, the mean seasonal precipitation was 30.7 inches for the same period. Mean seasonal precipitation for other stations in the survey area include Lompoc, 14.7 inches; San Luis Obispo, 21.7 inches; and San Ardo in Monterey County, 10.8 inches. Typical of Southern California, the variation in precipitation between wet and dry years is quite large. For example, rainfall at Santa Barbara totaled 45.2 inches in 1940-41 and 4.5 inches in 1876-77. Rainfall also tends to be persistent in that wet years tend to fall together with dry years, giving an apparent cycle of alternating wet and dry periods each of which may be several years in length.

Hydrologic Units and Subunits

For purposes of this investigation, the area of study was divided into a number of hydrologic units on the basis of cultural development, surface drainage, and geologic considerations related to the occurrence and movement of surface and ground water. These units and their numerical designations as shown on Plate 2 are Salinas Valley (3-4), San Luis Obispo (3-8), Nipomo-Arroyo Grande Coastal (3-10), Arroyo Grande (3-11), Santa Maria River Valley (3-12), Cuyama River Valley (3-13), San Antonio Creek Valley (3-14), Santa Ynez River Valley (3-15), South Coast Basins (3-16), Carrizo Plain (3-19), Cambria Group (3-21), and Santa Barbara County Coastal (3-22). These units were further divided into subunits again based upon cultural, geologic and topographic considerations. The boundaries of these units are also delineated on Plate 2. The areas of these hydrologic units and subunits are shown on Table 1.

Cultural Development

The first white men to visit San Luis Obispo and Santa Barbara Counties were navigators of the Spanish crown around 1542. However, the first settlement did not occur until the establishment of the mission San Luis Obispo de Tolosa in 1772. Settlement of Santa Barbara County did not occur until 1782 with the founding of the Presidio of Santa Barbara.

Agricultural Development

Agricultural development within the area of investigation began with the first plantings near the Mission San Luis Obispo between 1772 and 1774. The mission was located near San Luis Obispo Creek, which permitted irrigation by means of surface diversions. Shortly afterward, dry-farmed



Photo by Mark Hurd Aerial Surveys

CARPINTERIA, LOOKING NORTH

The growing of truck crops and citrus has become increasingly important in the economy of these areas.

grains were grown in the vicinity of Santa Margarita in the Salinas Valley, and orchard and truck crops were grown in Arroyo Grande. Agricultural development was further expanded in the vicinity of San Miguel, where water diverted from Santa Ysabel Springs irrigated wheat, corn, beans, orchard crops, and vineyards. Because of its agricultural development, the Mission San Luis Obispo was considered one of the wealthiest of the missions in California.

The initial development of agriculture in Santa Barbara County occurred around the Mission Santa Barbara between 1786 and 1800, where emphasis was placed on corn, fruit, and livestock.

Agriculture, principally livestock, continued in the area under the rancho system until around 1862 when a major drought, extending from 1862 to 1865 had catastrophic effects on the livestock industry, forcing the ranchos into bankruptcy. As a result, the rancho lands were sold to immigrants who established the small-scale farm and dairy industry which persists to this day. Dry-farmed grain, particularly wheat, increased between 1873 to 1915, when over 354,000 acres were reported to have been sown.

Dry farming has continued to be very important to the economy of the area. However, the growing of truck crops and citrus has become increasingly important, reaching a total of around 105,000 acres in 1949. Since that time irrigated agriculture, particularly in Santa Barbara County, has declined, principally because of the encroachment of urban development on those areas suitable for irrigated agriculture.

TABLE 1

AREAS OF HYDROLOGIC UNITS AND SUBUNITS

In acres

Hydrologic Unit and Subunit		Numerical Designation	Area
1.	Salinas Valley	3- 4.00	
	Paso Robles	3- 4.06	1,220,960
	Pozo	3- 4.07	<u>47,210</u>
	TOTAL		1,268,170
2.	San Luis Obispo	3- 8.00	
	Morro	3- 8.01	17,500
	Chorro	3- 8.02	30,110
	Los Osos	3- 8.03	18,090
	San Luis Obispo	3- 8.04	44,730
	Pismo	3- 8.05	30,270
	San Luis Coastal	3- 8.06	<u>27,980</u>
	TOTAL		168,680
3.	Nipomo-Arroyo Grande Coastal	3-10.00	1,530
4.	Arroyo Grande	3-11.00	
	Arroyo Grande	3-11.01	94,550
	Nipomo Mesa	3-11.02	16,190
	Nipomo Mesa surface drainage tributary to Arroyo Grande	3-11.11	<u>1,580</u>
	TOTAL		112,320
5.	Santa Maria River Valley	3-12.00	
	Santa Maria	3-12.01	150,250
	Sisquoc	3-12.02	<u>303,760</u>
	TOTAL		454,010
6.	Cuyama River Valley	3-13.00	
	Twitchell	3-13.01	14,460
	Cuyama	3-13.02	<u>717,080</u>
	TOTAL		731,540
7.	San Antonio Creek Valley	3-14.00	135,080

AREAS OF HYDROLOGIC UNITS AND SUBUNITS
(continued)

In acres

Hydrologic Unit and Subunit		Numerical Designation	Area
8.	Santa Ynez River Valley	3-15.00	
	Lompoc	3-15.01	68,800
	Santa Rita	3-15.02	76,950
	Buellton	3-15.03	58,210
	Santa Ynez	3-15.04	106,070
	Headwater	3-15.05	266,490
	TOTAL		576,520
9.	South Coast Basins	3-16.00	
	Goleta	3-16.01	33,770
	Santa Barbara	3-16.02	20,770
	Montecito	3-16.03	13,560
	Carpinteria	3-16.04	32,510
	TOTAL		100,610
10.	Carrizo Plain	3-19.00	285,740
11.	Cambria Group	3-21.00	
	San Carpoforo	3-21.01	28,460
	Arroyo de la Cruz	3-21.02	27,810
	San Simeon	3-21.03	49,860
	Santa Rosa	3-21.04	33,470
	Villa	3-21.05	14,990
	Cayucos	3-21.06	11,630
	Old	3-21.07	15,550
	Toro	3-21.08	9,820
	TOTAL		191,590
12.	Santa Barbara County Coastal	3-22.00	141,600
13.	Ventura River	4- 3.00	
	Upper Ventura	4- 3.02	3,820
14.	Santa Clara River	4- 4.00	
	Fillmore	4- 4.05	1,160
15.	San Joaquin	5- 0.00	54,600
	GRAND TOTAL		4,226,970

Urban and Suburban Development

As previously noted, San Luis Obispo and Santa Barbara Counties have been primarily agricultural areas. Since about 1950, however, the rate of population influx has increased rapidly. This expansion, which has been directly reflected in an increase of urban residential acreage, has been based on the generally favorable economics of the area, and State as a whole, and the location of the area between the major metropolitan complexes of Los Angeles and the San Francisco Bay area. In certain areas, such as Lompoc and Santa Maria, military establishments, such as Vandenberg Air Force Base, have greatly stimulated the population expansion. Table 2 presents the results of the decennial census for these counties, underscoring the rapid rate of growth in recent years.

TABLE 2

POPULATION OF SAN LUIS OBISPO AND SANTA BARBARA COUNTIES

Year	:	San Luis Obispo	:	Santa Barbara
	:	County	:	County
1880		9,142		9,513
1890		16,072		15,754
1900		16,637		18,934
1910		19,383		27,738
1920		21,893		41,097
1930		29,613		65,167
1940		33,246		70,555
1950		51,417		98,220
1960		81,044		168,962



Photo by Mark Hurd Aerial Surveys

Growth in cities and other concentrated areas of urban development has generally paralleled the population of the countywide areas. The population in 1930, 1940, 1950, and 1960, for the more important cities in the areas, is presented in Table 3. The data in this table particularly point up the growth of Lompoc and Santa Maria, as a result of activity at Vandenberg Air Force Base.

TABLE 3

POPULATION OF CITIES, SAN LUIS OBISPO AND
SANTA BARBARA COUNTIES

City	:	1930	:	1940	:	1950	:	1960
<u>San Luis Obispo County</u>								
Arroyo Grande		892		1,090		1,723		3,291
Atascadero		a		a		3,443		5,983
Paso Robles		2,573		3,045		4,835		6,677
San Luis Obispo		8,276		8,881		14,180		20,437
<u>Santa Barbara County</u>								
Carpinteria		a		a		2,864		4,998
Guadalupe		a		a		2,429		2,614
Lompoc		2,845		3,379		5,520		14,415
Santa Barbara		33,613		34,958		44,854		58,768
Santa Maria		a		8,522		10,440		20,027

a. Not available

Industrial activity in San Luis Obispo and Santa Barbara Counties has been primarily related to the processing and shipping of agricultural

products and to mineral extraction, particularly petroleum products, in addition to the military activity. Other industries include diatomite extraction and refining, fishing, and light manufacturing in the area.

Recreation has been an important source of income to the Counties of San Luis Obispo and Santa Barbara. Many county and state beaches and parks and reservoirs for fishing and boating are available for recreation purposes. The availability of these facilities within reasonable distances of the major metropolitan areas has made the area a favorite for vacationers

Water Supply Development

The water supply for urban and irrigated agricultural development in San Luis Obispo and Santa Barbara Counties has been derived from surface water diversions and extractions from ground water storage. At the present time, no significant amount of water is imported to the area of investigation.

The first irrigation system in California was reported to have been built at Mission San Miguel where irrigation water was diverted by ditch from Santa Ysabel Springs, 15 miles south of the mission. Irrigation and domestic supplies in the area were primarily dependent on minor stream diversions, although a reservoir constructed northwest of Mission Santa Barbara, in 1806, is still used by the City of Santa Barbara.

The drought of the early 1860's, which brought to a conclusion the rancho period in San Luis Obispo and Santa Barbara Counties, pointed up the need for a dependable water supply. In the early 1890's, wells drilled in the vicinity of the cities of Santa Barbara, Goleta, Carpinteria, and Lompoc provided artesian flows for supply to these areas. However, pressures were soon reduced and pumps were installed. The use of ground water



Josef Muench

Tideland Oil Wells

ELLWOOD OIL FIELD NEAR GOLETA

for irrigation increased rapidly after the introduction of deep well turbine pumps about 1920.

Surface Water Supply

The first major surface water development in the area of investigation was Gibraltar Dam in Santa Barbara County, which was completed in 1920 on the Santa Ynez River. The first major surface water development in San Luis Obispo County was Salinas Reservoir, constructed by the Corps of Engineers in 1942. After World War II, surface water development, primarily as a result of Bureau of Reclamation projects, has vastly increased in the area of investigation.

Present usable storage capacity is about 877,000 acre-feet, with an estimated safe seasonal yield of about 89,000 acre-feet. This includes approximately 2,000 acre-feet developed from tunnels which were constructed as part of dam and reservoir projects. In addition it includes only that portion of the yield of Nacimiento Reservoir which is allocated to San Luis Obispo County under its agreement with Monterey County.

Studies in connection with Bulletin No. 18 "San Luis Obispo County Investigation" and a number of studies in Santa Barbara County indicate that there is additional developable surface water yield in the area. Streams where such additional development may be feasible include Arroyo Grande Creek, Salsipuedes Creek, and a number of smaller streams in the northern portion of the Upper Salinas Valley.

Ground Water Supply

Although surface water supply has been important to the development of San Luis Obispo and Santa Barbara Counties, the major development

requiring water service has been based on ground water extractions. Studies have indicated that the seasonal safe yield of the ground water supply of San Luis Obispo and Santa Barbara Counties is on the order of 179,000 acre-feet per year. This does not include approximately 15,000 acre-feet per year attributable to that portion of the Salinas Valley in Monterey County, containing streams which are tributary to San Luis Obispo County.

In some portions of the survey area ground water extractions reportedly have exceeded the safe yield of local ground water basins. Areas where this problem exists include the Santa Maria Valley, San Antonio Valley, and the Cuyama Valley. Minor overdraft is also reported in the Carpinteria area.

Waste Water Disposal

The waste water effluent within the investigational area is:

(1) discharged to the Pacific Ocean or nearby tidal lagoons; (2) discharged to stream channels, where it percolates to underlying ground water basins; (3) applied directly to the land for irrigation purposes; or (4) disposed of in cesspools or septic tanks. For purposes of this investigation, it was assumed that waste water effluent discharged to the ocean or tidal lagoons was irrecoverably lost, but that a portion of all other effluent was available for reuse.

In 1959, discharges to the ocean or tidal lagoons were made from a number of cities and communities in the area of investigation, including Santa Barbara, Carpinteria, Goleta, Morro Bay, Shell Beach, and Pismo Beach. Available records of discharge to the ocean from these communities vary in length and in a number of cases consist only of estimated flows. Based upon available data, however, it was estimated that discharges to the ocean

or its tidal waters, during the 1958-59 water year, totaled about 8,200 acre-feet. This amount does not include oil field brines developed as a result of extractive processes. For purposes of comparison, it is estimated that about 3,000 acre-feet of sewage effluent was discharged to the ocean or tidal lagoons from the survey area during the 1948-49 water year.

CHAPTER III. LAND USE

The type, location, and areal extent of land use within the study area were determined from a compilation of data from a survey conducted by the Department of Water Resources during the summer of 1959. Results of this survey are presented in this chapter, together with the discussion of methods and procedures and tabulations of land use within the various hydrologic units or other appropriate subdivisions of the investigational area. This chapter also compares land uses existing in the area during the present survey with those which existed during previous surveys.

Methods and Procedures

In order to relate present land use to historic data, survey procedures similar to those used in Bulletin No. 2 were employed. Department survey teams delineated areas of the various land use types in the field, using either the most recent vertical aerial photographs of the area or, where these were not available, the latest U.S. Geological Survey seven and one-half minute quadrangle maps.

In the office, field delineations were transferred by projection to acetate overlays of U.S. Geological Survey quadrangle maps with a scale of 1:24,000 (one inch equals 2,000 feet). These maps served as control maps insuring accuracy of the succeeding processes; the acetate overlays were used as masters for reproducing land use delineations on vellum prints. The areas of the various types of land use were then cut from vellum prints and weighed; and using machine computing process these weights were converted into total acreages of individual land use types. Because of the control

developed through the use of the USGS quadrangles, the resulting overall acreage values can be considered accurate to within about plus or minus three percent. However, acreage values for individual areas should not be considered to have an accuracy of more than plus or minus five percent.

For purposes of a critical hydrologic analysis, it would be desirable to determine and compile the types of land use, either undeveloped or developed, for the entire area of a hydrologic unit, thus permitting a comprehensive analysis and an evaluation of the various levels of water use for the entire area. However, such a complete compilation is time-consuming and expensive; therefore, in areas not underlain by water-bearing material it is the usual practice to map only those types of land use requiring applied water. All other types of land use in such areas are tabulated in the "Unclassified" category.

Classification of Land Use

For purposes of analysis and presentation, the various land uses were grouped into two major categories under Water Service Areas: Urban and Suburban, and Irrigated Agriculture; and into three major categories under Nonwater Service Areas: Nonirrigated Agriculture, Native Vegetation, and Unclassified. The major categories under water service areas each include several classes of land use, and these several classes consist of various types of land use. The objective of this classification procedure was to group the various types of land use into classes, each of which were considered to require similar amounts of water.

The water service and nonwater service areas, major categories, specific classes, and types of land use included in the classification are as follows:

WATER SERVICE AREA

Urban and Suburban Category

<u>Class of Land Use</u>	<u>Type of Land Use</u>
Residential	Single and multiple family houses and apartments, rest homes, trailer parks, and residential subdivisions under construction at time of survey.
Commercial	All classes of commercial enterprises, including strip commercial and downtown commercial areas, schools, and hospitals.
Industrial	All classes of industrial land use involving manufacturing, processing, and packaging, but excluding extractive industries (oil, sand, and gravel), air fields, storage, distribution, and transportation facilities.
Unsegregated urban and suburban area	Dairies, farmsteads, livestock ranches, parks, cemeteries, and golf courses.
Included nonwater service area	Oil fields, tank farms, vacant lots, quarries, gravel pits, warehouses and storage yards, railroads, public streets, and landing strips of air fields.

Irrigated Agriculture Category

<u>Class of Land Use</u>	<u>Type of Land Use</u>
Alfalfa	Alfalfa raised for hay, seed, or pasture.
Pasture	Irrigated grasses and legumes other than alfalfa used for livestock forage.
Citrus and subtropical . .	Oranges, lemons, grapefruit, tangerines, avocados, dates, and olives.
Truck Crops	Fresh vegetables of all varieties, melons, flower seed, and nursery crops.

Class of Land Use (continued)Type of Land Use

Field crops	Sorghums, flax, sugar beets, and field corn.
Deciduous fruits and nuts .	All varieties of deciduous fruits and nuts.
Small grains	Barley, wheat, and oats.
Vineyards	All varieties.
Included nonwater service area	Public highways and roads, farm access roads, canals, drainage ditches and other inclusions not devoted to crop production, including idle and abandoned lands.

NONWATER SERVICE AREAType of Land Use

Nonirrigated Agriculture Category	All varieties of dry-farmed crops, including pasture overlying defined ground water basins.
Native Vegetation Category	Native grasses, brush and trees, including phreatophytes overlying defined ground water basins.
Unclassified Category	Bare ground, including river washes, beaches, and water surface overlying defined ground water basins. It also includes nonirrigated agriculture and native vegetation not overlying defined ground water basins, and military reservations.

The classes of land use given here are similar to those used in Bulletin No. 2, except that schools, included in "Unsegregated Urban and Suburban Area," in Bulletin No. 2 are herein classified as "Commercial"; in addition, parks, golf courses and cemeteries classified as "Irrigated Pasture" in Bulletin No. 2 are considered "Unsegregated Urban and Suburban Area" in this report.

In delineating land use types in the field, no attempt was made to exclude such items as streets, roads, railroads, power line rights-of-way and other essentially nonwater-using lands occurring within the surveyed areas. Instead, these land uses were classified as "Included Nonwater Service Area," and were extracted from gross land use totals by applying to each land use class a percentage value appropriate for that class. The major classes of land use and appropriate reduction factors are presented in Table 4. The net acreage values used in the tables summarizing land use represent the gross acreage values minus those portions of the gross values which have been deducted for these "Included Nonwater Service Areas."

TABLE 4
FACTORS FOR REDUCTION OF GROSS AREAS
TO NET WATER SERVICE AREAS

Land use	: Percent deducted : from gross area
Residential	25
Commercial	35
Industrial manufacturing	25
Parks, cemeteries and golf courses	15
Farmsteads, feed lots, dairies	10
Irrigated agriculture	5

Many areas located within military reservations throughout the area of investigation are restricted to entry and have not been field mapped. Therefore, land use in such areas was included in the summary tables under the category "Unclassified." Although such classification would tend to lower the totals given for urban and agricultural development in this report, water demand on such bases can, as a practical matter,

be obtained from military authorities should such information be required for determining future water requirements.

Results of Land Use Survey

Data derived from this land use survey are compiled in Table 5 according to hydrologic units and in Table 6 according to counties. In Appendix B, a tabulation is presented showing land use within hydrologic units and subunits delineated on Plate 2. These tables show that at the time of survey the gross acreage requiring water service within the area of investigation was about 152,600 acres, of which about 109,900 acres, or 72 percent, were devoted to irrigated agriculture.

The data presented in Table 5 indicate the pattern of development and its relationship to topography and climate. For example, large acreages of truck crops and, in some instances, field crops are grown in the coastal river plains, such as the Santa Maria, Santa Ynez, and Arroyo Grande Units. Conversely, in certain of the more inland valleys, such as Salinas and Cuyama, more pasture and alfalfa crops are grown. Data in Table 5 also indicate the relationship between water service area, non-irrigated agriculture, native vegetation, and the total area of investigation. It will be noted that nonirrigated agriculture comprises more than twice the acreage of all water service area. Particularly large acreages of nonirrigated agriculture are found in the Salinas Valley Unit and the Carrizo Plain Unit. For the most part, these acreages consist of non-irrigated grain and hay.

Also indicated on Table 5 are the very large acreages of unclassified lands, amounting to about two-thirds of the total land area in the two counties. Although military areas and some nonirrigated agriculture

San	:	Ventura	:	Santa	:	Nipomo-	:	
aquin	:	River	:	Clara	:	Arroyo	:	Totals
:	:	:	:	River	:	Grande	:	
:	:	:	:	:	:	Coastal	:	

**	0	0	0	13,690
**	0	0	0	1,910
0	0	0	0	1,830
<u>80</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>10,250</u>
80	0	0	0	27,680
<u>10</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>14,990</u>
90	0	0	0	42,670
0	0	0	0	19,300
0	0	0	0	15,220
0	0	0	0	10,080
0	0	0	0	26,200
0	0	0	0	19,060
0	0	0	0	3,010
0	0	0	0	620
<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>10</u>
0	0	0	0	93,500
0	0	0	0	8,500
<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>7,910</u>
<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>109,910</u>
90	0	0	0	152,580
,950	0	0	0	349,320
,280	0	0	70	847,720
,280	<u>3,820</u>	<u>1,160</u>	<u>1,460</u>	<u>2,877,350</u>
,510	<u>3,820</u>	<u>1,160</u>	<u>1,530</u>	<u>4,074,390</u>
,600	3,820	1,160	1,530	4,226,970

be obtained from military authorities should such information be required for determining future water requirements.

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Also indicated on Table 5 are the very large acreages of unclassified lands, amounting to about two-thirds of the total land area in the two counties. Although military areas and some nonirrigated agriculture

TABLE 5

LAND USE IN HYDROLOGIC UNITS OF THE
SOUTHERN PORTION OF THE CENTRAL COASTAL AREA, 1959

In acres

Category and class of land use	Hydrologic Unit																Totals
	Salinas	Cambria	San Luis	Arroyo	Carrizo	Cuyama	Santa	San	Santa		South	San	Ventura	Santa	Nipomo-		
	Valley	Group	Obispo	Grande	Plain	River Valley	River Valley	Creek Valley	Ynez Valley	Barbara*	Coast Basins	Joaquin	River	Clara River	Arroyo Grande Coastal		
WATER SERVICE AREA																	
Urban and Suburban																	
Residential	1,020	300	2,050	900	0	80	1,700	80	1,160	6,370	30	**	0	0	0	13,690	
Commercial	260	40	340	70	**	60	240	30	150	720	**	**	0	0	0	1,910	
Industrial	30	0	80	30	0	20	190	1,340	40	90	10	0	0	0	0	1,830	
Unsegregated urban and suburban area	<u>2,610</u>	<u>390</u>	<u>1,500</u>	<u>770</u>	<u>300</u>	<u>470</u>	<u>1,260</u>	<u>220</u>	<u>1,400</u>	<u>1,130</u>	<u>120</u>	<u>80</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>10,250</u>	
Subtotals	3,920	730	3,970	1,770	300	630	3,390	1,670	2,750	8,310	160	80	0	0	0	27,680	
Included Nonwater-Service Area	<u>1,850</u>	<u>220</u>	<u>1,880</u>	<u>1,250</u>	<u>40</u>	<u>1,090</u>	<u>2,740</u>	<u>560</u>	<u>1,090</u>	<u>4,070</u>	<u>190</u>	<u>10</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>14,990</u>	
Gross Urban and Suburban Area	5,770	950	5,850	3,020	340	1,720	6,130	2,230	3,840	12,380	350	90	0	0	0	42,670	
Irrigated Agriculture																	
Alfalfa	6,720	310	770	200	270	6,020	2,820	240	1,840	50	60	0	0	0	0	19,300	
Pasture	4,160	740	1,720	420	0	1,100	2,830	150	3,810	160	130	0	0	0	0	15,220	
Citrus and subtropical	**	0	30	10	0	20	0	0	0	9,180	840	0	0	0	0	10,080	
Truck crops	420	40	1,070	2,420	0	550	15,490	80	5,420	650	60	0	0	0	0	26,200	
Field crops	2,120	330	1,240	430	100	730	8,700	1,630	3,580	180	20	0	0	0	0	19,060	
Deciduous fruits and nuts	100	20	20	210	0	30	20	0	1,470	510	630	0	0	0	0	3,010	
Small grains	310	10	120	0	0	100	40	10	0	0	30	0	0	0	0	620	
Vineyards	<u>10</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>10</u>	
Subtotals	13,840	1,450	4,970	3,690	370	8,550	29,900	2,110	16,120	10,730	1,770	0	0	0	0	93,500	
Fallow	360	30	460	720	0	770	5,420	0	520	220	0	0	0	0	0	8,500	
Included Nonwater-Service Area	<u>1,500</u>	<u>140</u>	<u>510</u>	<u>510</u>	<u>20</u>	<u>470</u>	<u>2,260</u>	<u>110</u>	<u>1,610</u>	<u>690</u>	<u>90</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>7,910</u>	
Gross Irrigated Agriculture	<u>15,700</u>	<u>1,620</u>	<u>5,940</u>	<u>4,920</u>	<u>390</u>	<u>9,790</u>	<u>37,580</u>	<u>2,220</u>	<u>18,250</u>	<u>11,640</u>	<u>1,860</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>109,910</u>	
GROSS WATER SERVICE	21,470	2,570	11,790	7,940	730	11,510	43,710	4,450	22,090	24,020	2,210	90	0	0	0	152,580	
NONWATER-SERVICE AREA																	
Nonirrigated Agriculture	218,950	1,480	7,110	1,060	69,740	10,780	8,100	7,070	15,500	1,110	470	7,950	0	0	0	349,320	
Native Vegetation	268,970	4,130	12,980	20,170	99,010	159,900	83,120	43,120	126,210	13,010	2,750	14,280	0	0	70	847,720	
Unclassified	<u>758,780</u>	<u>183,410</u>	<u>136,800</u>	<u>83,150</u>	<u>116,260</u>	<u>549,350</u>	<u>319,080</u>	<u>80,440</u>	<u>412,720</u>	<u>62,470</u>	<u>136,170</u>	<u>32,280</u>	<u>3,820</u>	<u>1,160</u>	<u>1,460</u>	<u>2,877,350</u>	
GROSS NONWATER-SERVICE AREA	<u>1,246,700</u>	<u>189,020</u>	<u>156,890</u>	<u>104,380</u>	<u>285,010</u>	<u>720,030</u>	<u>410,300</u>	<u>130,630</u>	<u>554,430</u>	<u>76,590</u>	<u>139,390</u>	<u>54,510</u>	<u>3,820</u>	<u>1,160</u>	<u>1,530</u>	<u>4,074,390</u>	
TOTALS	1,268,170	191,590	168,680	112,320	285,740	731,540	454,010	135,080	576,520	100,610	141,600	54,600	3,820	1,160	1,530	4,226,970	

* Santa Barbara County Coastal.

**Less than 5 acres.



TABLE 6

OF THE SOUTHERN PORTION
COASTAL AREA, 1959

acres

Santa Barbara	:	Monterey	:	Ventura	:	Kern	:	Totals
,350		0		10		0		13,690
,170		*		10		0		1,910
,660		0		0		0		1,830
<u>,170</u>		<u>110</u>		<u>70</u>		<u>30</u>		<u>10,250</u>
,350		110		90		30		27,680
<u>,480</u>		<u>20</u>		<u>20</u>		<u>—</u> *		<u>14,990</u>
,830		130		110		30		42,670
,300		10		40		0		19,300
,590		210		90		0		15,220
,910		0		140		0		10,080
,780		0		*		0		26,200
,930		260		0		0		19,060
,660		0		*		0		3,010
60		0		0		0		620
<u>0</u>		<u>0</u>		<u>0</u>		<u>0</u>		<u>10</u>
,230		480		270		0		93,500
,010		0		0		0		8,500
<u>,420</u>		<u>110</u>		<u>10</u>		<u>0</u>		<u>7,910</u>
,660		590		280		0		109,910
,490		720		390		30		152,580
,100		27,920		50		610		349,320
,180		58,730		46,190		1,410		847,720
<u>,880</u>		<u>190,760</u>		<u>115,720</u>		<u>30,400</u>		<u>2,877,350</u>
<u>,160</u>		<u>277,410</u>		<u>161,960</u>		<u>32,420</u>		<u>4,074,390</u>
,650		278,130		162,350		32,450		4,226,970



TABLE 6

LAND USE IN COUNTIES OF THE SOUTHERN PORTION
OF THE CENTRAL COASTAL AREA, 1959

In acres

Category and class of land use	: San Luis : Obispo	: Santa : Barbara	: Monterey	: Ventura	: Kern	: Totals
<u>WATER SERVICE AREA</u>						
<u>Urban and Suburban</u>						
Residential	4,330	9,350	0	10	0	13,690
Commercial	730	1,170	*	10	0	1,910
Industrial	170	1,660	0	0	0	1,830
Unsegregated urban and suburban area	<u>5,870</u>	<u>4,170</u>	<u>110</u>	<u>70</u>	<u>30</u>	<u>10,250</u>
Subtotals	11,100	16,350	110	90	30	27,680
Included Nonwater-Service Area	<u>5,470</u>	<u>9,480</u>	<u>20</u>	<u>20</u>	<u>*</u>	<u>14,990</u>
Gross Urban and Suburban Area	16,570	25,830	130	110	30	42,670
<u>Irrigated Agriculture</u>						
Alfalfa	11,950	7,300	10	40	0	19,300
Pasture	8,330	6,590	210	90	0	15,220
Citrus and subtropical	30	9,910	0	140	0	10,080
Truck crops	8,420	17,780	0	*	0	26,200
Field crops	5,870	12,930	260	0	0	19,060
Deciduous fruits and nuts	350	2,660	0	*	0	3,010
Small grains	560	60	0	0	0	620
Vineyards	<u>10</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>10</u>
Subtotals	35,520	57,230	480	270	0	93,500
Fallow	3,490	5,010	0	0	0	8,500
Included Nonwater-Service Area	<u>3,370</u>	<u>4,420</u>	<u>110</u>	<u>10</u>	<u>0</u>	<u>7,910</u>
Gross Irrigated Agriculture	<u>42,380</u>	<u>66,660</u>	<u>590</u>	<u>280</u>	<u>0</u>	<u>109,910</u>
GROSS WATER SERVICE AREA	58,950	92,490	720	390	30	152,580
<u>NONWATER-SERVICE AREA</u>						
<u>Nonirrigated Agriculture</u>	280,640	40,100	27,920	50	610	349,320
<u>Native Vegetation</u>	409,210	332,180	58,730	46,190	1,410	847,720
<u>Unclassified</u>	<u>1,377,590</u>	<u>1,162,880</u>	<u>190,760</u>	<u>115,720</u>	<u>30,400</u>	<u>2,877,350</u>
GROSS NONWATER-SERVICE AREA	<u>2,067,440</u>	<u>1,535,160</u>	<u>277,410</u>	<u>161,960</u>	<u>32,420</u>	<u>4,074,390</u>
TOTALS	2,126,390	1,627,650	278,130	162,350	32,450	4,226,970

*Less than five acres.



acreages which do not overlies ground water basins, are included in this category, the greater portion of lands in this category are mountainous areas, most of which are not suitable for intensive development.

A determination of the amount of land considered susceptible of intensive water-using development, in the major portion of San Luis Obispo and Santa Barbara Counties, was made in connection with the preparation of Department of Water Resources Bulletin No. 78, "Investigation of Alternative Aqueduct Systems to Serve Southern California." In that report, the estimated gross urban and suburban acreage in the year 2020 was estimated to be about 193,000 acres, exclusive of the Cuyama River and Carrizo Plain areas, and military land. For a comparable area, the 1959 value of urban development totaled about 40,600 acres, or about 21 percent of the forecast value. The estimated net irrigated acreage for the year 2020 was forecast to be 131,000 acres, exclusive of the Cuyama River and Carrizo Plain areas. A comparable figure in 1959 totaled about 84,600 acres, or about 65 percent of the forecast value.

Detailed information concerning the pattern of land use as determined from this survey may be found on Plates 3A, 3B, and 3C, "Present Land Use." Although the acreage of nonwater service area within the urban and suburban and agricultural areas is shown separately on the summary tables in this chapter, it is not differentiated on these plates. Developed nonwater service lands, such as nonirrigated agriculture, and undeveloped nonwater service lands, such as native vegetation, also shown separately on the summary tables, are not differentiated on these plates.

A tabulation of land use as observed within the boundaries of major county water districts in San Luis Obispo and Santa Barbara Counties

is presented in Table 7. This table shows that a gross water service area of about 17,500 acres was included within these water districts. This comprised about 11 percent of the gross total water service area in the area of investigation. Table 8 indicates land use according to municipalities. It will be noted that the gross total water service area of these municipalities is about 14,800 acres.

Change in Land Use

An indication of the changes which are occurring in the uses of land in the area of investigation is shown by the data presented in Table 9. This table compares the acreages of the various classes of land use determined from a survey made of the entire area in 1949 and a survey made of San Luis Obispo County in 1953, with the results of the 1959 survey. The change in land use in the two counties is shown on Plate 4, "Change in Land Use San Luis Obispo County, 1953 to 1959," and Plates 5A and 5B, "Change in Land Use San Luis Obispo County, 1953 to 1959 and Santa Barbara County, 1949 to 1959."

Table 9 indicates that between 1949 and 1959 land use in the urban and suburban category increased about 11,500 acres, or about 225 percent, in San Luis Obispo County; and 15,900 acres, or about 160 percent in Santa Barbara County. The total increase in land use in this category between 1949 and 1959 was about 27,400 acres in the investigational area.

Irrigated agriculture increased about 10,200 acres in San Luis Obispo County between 1949 and 1959, but decreased nearly 16,900 acres in Santa Barbara County. In San Luis Obispo County increases occurred in lands devoted to alfalfa and pasture; at the same time, there were significant decreases in truck crops and field crops. Most of these changes occurred between 1949 and 1953.

LE 7

COUNTY WATER DISTRICTS
SANTA BARBARA COUNTIES, 1959

Acres

County water districts			
Goleta	Montecito	Atascadero	Totals
1,090	1,260	300	2,940
160	20	40	260
20	*	*	20
<u>560</u>	<u>210</u>	<u>280</u>	<u>1,180</u>
1,830	1,490	620	4,400
<u>970</u>	<u>600</u>	<u>180</u>	<u>2,100</u>
2,800	2,090	800	6,500
50	0	20	70
140	*	50	200
3,970	660	*	7,480
290	20	10	590
140	0	0	180
450	0	20	510
0	0	0	0
<u>0</u>	<u>0</u>	<u>*</u>	<u>*</u>
5,040	680	100	9,030
180	10	20	240
<u>730</u>	<u>260</u>	<u>30</u>	<u>1,700</u>
5,950	950	150	10,970
8,750	3,040	950	17,470
840	90	90	1,110
4,790	2,260	340	9,370
<u>6,160</u>	<u>2,410</u>	<u>5,340</u>	<u>15,830</u>
11,790	4,760	5,770	26,310
20,540	7,800	6,720	43,780

is presented in Table 7. This table shows that a gross water service area of about 17,500 acres was included within these water districts. This comprised about 11 percent of the gross total water service area in the area of investigation. Table 8 indicates land use according to municipalities. It will be noted that the gross total water service area of these municipalities is about 14,800 acres.

Change in Land Use

An indication of the changes which are occurring in the uses of land in the area of investigation is shown by the data presented in Table 9. This table compares the acreages of the various classes of land use determined from a survey made of the entire area in 1949 and a survey made of San Luis Obispo County in 1953, with the results of the 1959 survey. The change in land use in the two counties is shown on Plate 4, "Change in Land Use San Luis Obispo County, 1953 to 1959," and Plates 5A and 5B, "Change in Land Use San Luis Obispo County, 1953 to 1959 and Santa Barbara County, 1949 to 1959."

Table 9 indicates that between 1949 and 1959 land use in the urban and suburban category increased about 11,500 acres, or about 225 percent, in San Luis Obispo County; and 15,900 acres, or about 160 percent in Santa Barbara County. The total increase in land use in this category between 1949 and 1959 was about 27,400 acres in the investigational area.

Irrigated agriculture increased about 10,200 acres in San Luis Obispo County between 1949 and 1959, but decreased nearly 16,900 acres in Santa Barbara County. In San Luis Obispo County increases occurred in lands devoted to alfalfa and pasture; at the same time, there were significant decreases in truck crops and field crops. Most of these changes occurred between 1949 and 1953.

TABLE 7

LAND USE IN MAJOR COUNTY WATER DISTRICTS
IN SAN LUIS OBISPO AND SANTA BARBARA COUNTIES, 1959

In acres

Category and class of land use	County water districts				
	Carpinteria	Goleta	Montecito	Atascadero	Totals
<u>WATER SERVICE AREA</u>					
<u>Urban and Suburban</u>					
Residential	290	1,090	1,260	300	2,940
Commercial	40	160	20	40	260
Industrial	0	20	*	*	20
Unsegregated urban and suburban area	<u>130</u>	<u>560</u>	<u>210</u>	<u>280</u>	<u>1,180</u>
Subtotals	460	1,830	1,490	620	4,400
Included Nonwater-Service Area	<u>350</u>	<u>970</u>	<u>600</u>	<u>180</u>	<u>2,100</u>
Gross Urban and Suburban Area	810	2,800	2,090	800	6,500
<u>Irrigated Agriculture</u>					
Alfalfa	0	50	0	20	70
Pasture	10	140	*	50	200
Citrus and subtropical	2,850	3,970	660	*	7,480
Truck crops	270	290	20	10	590
Field crops	40	140	0	0	180
Deciduous fruits and nuts	40	450	0	20	510
Small grains	0	0	0	0	0
Vineyards	<u>0</u>	<u>0</u>	<u>0</u>	<u>*</u>	<u>*</u>
Subtotals	3,210	5,040	680	100	9,030
Fallow	30	180	10	20	240
Included Nonwater-Service Area	<u>680</u>	<u>730</u>	<u>260</u>	<u>30</u>	<u>1,700</u>
Gross Irrigated Agriculture	<u>3,920</u>	<u>5,950</u>	<u>950</u>	<u>150</u>	<u>10,970</u>
GROSS WATER SERVICE AREA	4,730	8,750	3,040	950	17,470
<u>NONWATER-SERVICE AREA</u>					
<u>Nonirrigated Agriculture</u>	90	840	90	90	1,110
<u>Native Vegetation</u>	1,980	4,790	2,260	340	9,370
<u>Unclassified</u>	<u>1,920</u>	<u>6,160</u>	<u>2,410</u>	<u>5,340</u>	<u>15,830</u>
GROSS NONWATER-SERVICE AREA	<u>3,990</u>	<u>11,790</u>	<u>4,760</u>	<u>5,770</u>	<u>26,310</u>
TOTALS	8,720	20,540	7,800	6,720	43,780

*Less than 5 acres.



LE 8

IPAL SERVICE AREAS
ANTA BARBARA COUNTIES, 1959

cres

Municipalities					
San Luis	Arroyo-	Santa	Lompoc	Santa	Totals
Obispo	Grande	Maria		Barbara	
1,030	210	840	670	3,160	6,380
130	40	150	60	370	830
30	*	20	10	70	130
<u>70</u>	<u>80</u>	<u>90</u>	<u>30</u>	<u>220</u>	<u>560</u>
1,260	330	1,100	770	3,820	7,900
<u>460</u>	<u>220</u>	<u>1,030</u>	<u>500</u>	<u>2,140</u>	<u>4,860</u>
1,720	550	2,130	1,270	5,960	12,760
*	0	40	0	0	50
70	*	0	*	0	70
0	10	0	0	110	120
30	190	560	80	40	900
0	0	210	120	0	330
0	60	0	0	0	60
0	0	0	0	0	0
<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>
100	260	810	200	150	1,530
0	30	90	40	*	160
<u>10</u>	<u>20</u>	<u>130</u>	<u>150</u>	<u>10</u>	<u>320</u>
<u>110</u>	<u>310</u>	<u>1,030</u>	<u>390</u>	<u>160</u>	<u>2,010</u>
1,830	860	3,160	1,660	6,120	14,770
80	150	130	220	70	880
200	300	90	260	2,390	3,710
<u>1,360</u>	<u>590</u>	<u>0</u>	<u>0</u>	<u>2,400</u>	<u>4,360</u>
<u>1,640</u>	<u>1,040</u>	<u>220</u>	<u>480</u>	<u>4,860</u>	<u>8,950</u>
3,470	1,900	3,380	2,140	10,980	23,720



TABLE 8

LAND USE IN MUNICIPAL SERVICE AREAS
IN SAN LUIS OBISPO AND SANTA BARBARA COUNTIES, 1959

In acres

Category and class of land use	Municipalities						
	: Paso : Robles	: San Luis : Obispo	: Arroyo- : Grande	: Santa : Maria	: Lompoc	: Santa : Barbara	: Totals
<u>WATER SERVICE AREA</u>							
<u>Urban and Suburban</u>							
Residential	470	1,030	210	840	670	3,160	6,380
Commercial	80	130	40	150	60	370	830
Industrial	*	30	*	20	10	70	130
Unsegregated urban and suburban area	<u>70</u>	<u>70</u>	<u>80</u>	<u>90</u>	<u>30</u>	<u>220</u>	<u>560</u>
Subtotals	620	1,260	330	1,100	770	3,820	7,900
Included Nonwater-Service Area	<u>510</u>	<u>460</u>	<u>220</u>	<u>1,030</u>	<u>500</u>	<u>2,140</u>	<u>4,860</u>
Gross Urban and Suburban Area	1,130	1,720	550	2,130	1,270	5,960	12,760
<u>Irrigated Agriculture</u>							
Alfalfa	10	*	0	40	0	0	50
Pasture	*	70	*	0	*	0	70
Citrus and subtropical	0	0	10	0	0	110	120
Truck crops	0	30	190	560	80	40	900
Field crops	0	0	0	210	120	0	330
Deciduous fruits and nuts	0	0	60	0	0	0	60
Small grains	0	0	0	0	0	0	0
Vineyards	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>
Subtotals	10	100	260	810	200	150	1,530
Fallow	0	0	30	90	40	*	160
Included Nonwater-Service Area	<u>0</u>	<u>10</u>	<u>20</u>	<u>130</u>	<u>150</u>	<u>10</u>	<u>320</u>
Gross Irrigated Agriculture	<u>10</u>	<u>110</u>	<u>310</u>	<u>1,030</u>	<u>390</u>	<u>160</u>	<u>2,010</u>
GROSS WATER SERVICE AREA	1,140	1,830	860	3,160	1,660	6,120	14,770
<u>NONWATER-SERVICE AREA</u>							
<u>Nonirrigated Agriculture</u>	230	80	150	130	220	70	880
<u>Native Vegetation</u>	470	200	300	90	260	2,390	3,710
<u>Unclassified</u>	<u>10</u>	<u>1,360</u>	<u>590</u>	<u>0</u>	<u>0</u>	<u>2,400</u>	<u>4,360</u>
GROSS NONWATER-SERVICE AREA	<u>710</u>	<u>1,640</u>	<u>1,040</u>	<u>220</u>	<u>480</u>	<u>4,860</u>	<u>8,950</u>
TOTALS	1,850	3,470	1,900	3,380	2,140	10,980	23,720

*Less than 5 acres.



TABLE 9

LUIS OBISPO AND SANTA BARBARA COUNTIES

In acres

County		Santa Barbara County				Total-Both Counties		
Change	Change	1949	1959	Change	1949	1959	Change	1949
1949-	1953-	1949	1959	1949-	1949	1959	1949-	1959
1959	1959			1959			1959	
*	*	*	9,350	*	*	13,680	*	
*	*	*	1,170	*	*	1,900	*	
*	*	*	1,660	*	*	1,830	*	
*	*	*	4,170	*	*	10,040	*	
5,370		*	16,350	*	*	27,450	*	
*	*	*	9,480	*	*	14,950	*	
11,470	*	9,900	25,830	15,930	15,000	42,400	27,400	
9,550	2,080	8,400	7,300	- 1,100	10,800	19,250	8,450	
6,830	3,100	6,200	6,590	390	7,700	14,920	7,220	
30	30	10,300	9,910	- 390	10,300	9,940	- 360	
4,680	840	35,200	17,780	-17,420	48,300	26,200	-22,100	
1,830	2,100	11,100	12,930	1,830	18,800	18,800	0	
250	- 140	2,900	2,660	- 240	3,500	3,010	- 490	
560	- 910	0	60	60	0	620	620	
10	10	0	0	0	0	10	10	
10,220	7,110	74,100	57,230	-16,870	99,400	92,750	- 6,650	
5,960	*	2,100	9,430	7,330	3,000	16,290	13,290	
16,180	*	76,200	66,660	- 9,540	102,400	109,040	6,640	
*	12,480	*	73,580	*	*	120,200	*	
27,650	*	86,100	92,490	6,390	117,400	151,440	34,040	



TABLE 9

CHANGE IN LAND USE IN SAN LUIS OBISPO AND SANTA BARBARA COUNTIES

In acres

Category and class of land use	San Luis Obispo County						Santa Barbara County			Total-Both Counties		
	:		:		:		:		:		:	
	:		:		:		:		:		:	
	1949	1953	1959	Change 1949-1953	Change 1953-1959		1949	1959	Change 1949-1959	1949	1959	Change 1949-1959
	:	:	:	:	:	:	:	:	:	:	:	:
	:	:	:	:	:	:	:	:	:	:	:	:
<u>WATER SERVICE AREA</u>												
<u>Urban and Suburban</u>												
Residential	*	*	4,330	*	*		*	9,350	*	*	13,680	*
Commercial	*	*	730	*	*		*	1,170	*	*	1,900	*
Industrial	*	*	170	*	*		*	1,660	*	*	1,830	*
Unsegregated urban and suburban area	*	*	5,870	*	*		*	4,170	*	*	10,040	*
Subtotals	*	5,730	11,100	*	5,370		*	16,350	*	*	27,450	*
Included Nonwater-Service Area	*	*	5,470	*	*		*	9,480	*	*	14,950	*
Gross Urban and Suburban Area	5,100	*	16,570	11,470	*		9,900	25,830	15,930	15,000	42,400	27,400
<u>Irrigated Agriculture</u>												
Alfalfa	2,400	9,870	11,950	9,550	2,080		8,400	7,300	- 1,100	10,800	19,250	8,450
Pasture	1,500	5,230	8,330	6,830	3,100		6,200	6,590	390	7,700	14,920	7,220
Citrus and subtropical	0	*	30	30	30		10,300	9,910	- 390	10,300	9,940	- 360
Truck crops	13,100	7,580	8,420	- 4,680	840		35,200	17,780	-17,420	48,300	26,200	-22,100
Field crops	7,700	3,770	5,870	- 1,830	2,100		11,100	12,930	1,830	18,800	18,800	0
Deciduous fruits and nuts	600	490	350	- 250	- 140		2,900	2,660	- 240	3,500	3,010	- 490
Small grains	0	1,470	560	560	- 910		0	60	60	0	620	620
Vineyards	0	*	10	10	10		0	0	0	0	10	10
Subtotals	25,300	28,410	35,520	10,220	7,110		74,100	57,230	-16,870	99,400	92,750	- 6,650
Included Nonwater-Service Area	900	*	6,860	5,960	*		2,100	9,430	7,330	3,000	16,290	13,290
Gross Irrigated Agriculture	26,200	*	42,380	16,180	*		76,200	66,660	- 9,540	102,400	109,040	6,640
NET WATER SERVICE AREA	*	34,140	46,620	*	12,480		*	73,580	*	*	120,200	*
GROSS WATER SERVICE AREA	31,300	*	58,950	27,650	*		86,100	92,490	6,390	117,400	151,440	34,040

*Value not available.



In Santa Barbara County there was a major decrease in truck crop acreage between 1949 and 1959, from 35,200 acres to 17,800 acres. Much of this decrease resulted from agricultural land being diverted to urban use.

Multiple Cropped Areas

In the coastal portions of the area of investigation, where the short, mild winters permit crops to be raised on a year-round basis, field mapping conducted during the summer season characteristically reveals large acreages of land in a fallow or between-crop condition. Under normal cropping practices, a large portion of this fallow land will be planted at some subsequent time during the study period. Since the net water use of fallow lands is negligible, estimates of net water use based on data collected only during the summer survey would not be truly representative of conditions in the study area.

For this reason, following the main 1959 summer survey, three supplemental resurveys were conducted in the agricultural areas subject to multiple cropping in order to determine the subsequent use of acreage found fallow during the summer. These resurveys were made during November 1959, and February and May 1960. During each of the resurveys, the type and areal extent of crops planted in the acreage which had been found fallow during the main summer survey, were determined.

Field mapping during these resurveys indicated that portions of the fallow acreages were planted, then subsequently replanted to different crops, or allowed to revert to fallow conditions. However, during the analysis of the resurvey data from which the percentages shown in Table 10 were derived, the type and areal extent of crops were considered on a

cumulative basis. For this analysis, the first crop mapped on a previously fallow parcel was used as the basis for assigning unit use values. That parcel was then removed from the fallow classification for the remainder of the study period. However, the increased use of water resulting from multiple cropping practices, including fallow periods between crops, was considered in estimating average unit values of water use for truck crops.

TABLE 10
DISPOSITION OF ACREAGE FOUND FALLOW
IN SUMMER 1959

In percent of summer fallow acreage

Hydrologic Unit	Type of Land Use			Total
	Area	Irrigated crop		
	remaining:	plantings		
	fallow	Truck	Field	
	all year	crops	crops	
Cambria Group	70	30	0	100
San Luis Obispo	70	30	0	100
Arroyo Grande	20	80	0	100
Santa Maria River Valley	10	70	20	100
Santa Ynez River Valley	50	40	10	100
Santa Barbara County Coastal	90	10	0	100

Analysis of the data from the resurveys indicates that of the total area indicated as fallow during the summer survey, a portion of this total area remained fallow throughout the entire year, as shown on Table 10. The remaining land, which had been mapped fallow during the

main survey, was found during the subsequent resurveys to be planted to crops in the percentages shown on Table 10.

Although the percentage values given in Table 10 were used as the basis for distributing the fallow acreages determined from the 1959 ~~summer~~ survey into the appropriate crops for determining water requirements, they were not used in compiling the acreage values for irrigated crops presented in Tables 5, 6, 7, 8, and 9, and in Appendix B.



San Luis Obispo and Santa Barbara Counties have been primarily agricultural areas.

CHAPTER IV. WATER USE

Land occupied by various types of water-using development in San Luis Obispo and Santa Barbara Counties and tributary areas described in Chapter III, and appropriate unit values of water use were employed in this investigation to estimate the 1959 level of water use. This chapter presents the resulting estimates of water use, and indicates the change in water use in the area of investigation since previous estimates were made. Also presented is a discussion of the relationship between estimated levels of water use and available water supplies, for both 1959 and projected future conditions.

Definition of Water Use

The term "water use" is employed in the broadest sense to include all uses of water by nature under native conditions, and by man-made modifications of those natural conditions. It implies the use of water for any one, or all, of innumerable purposes, both consumptive and nonconsumptive.

Consumptive use includes the water from any source utilized in the process of vegetative growth, such as transpiration and the building of plant tissue, and the water evaporated from the soil around the plant and foliage, as well as from water surfaces. It also includes the water consumed or evaporated by urban and nonvegetative types of land use.

In addition to the consumptive use of water, as defined above, there may be irrecoverable losses incidental to such use. These irrecoverable losses include such items as disposal or seepage of the unconsumed water to bodies of water of unsuitable quality including the ocean, and

disposal or seepage of the unconsumed water in such a manner that its recapture for use would be uneconomical.

Water for consumptive use is obtained from two general sources: natural sources, including direct precipitation and surface runoff, and, as a special case, from a high ground water table; and man-developed sources, that is, water applied through the activities of man. Water furnished from this latter source is defined as "applied water."

In evaluating the overall needs for water in an area, it is necessary to determine what portion of the applied water is consumptively used. Man applies water to satisfy the consumptive use demands in excess of that supplied from natural sources. However, as a practical matter, the quantity of water applied usually exceeds that actually consumed. For this reason a portion of the water applied for any use may not be consumed or irrecoverably lost, thus, it again becomes part of the water supply and is available for reuse. The portion of the applied water that is consumptively used, or irrecoverably lost, is defined as the "net water use," and the difference between the applied water and the net water use is the amount of applied water that is available for reuse as a part of the common supply.

Methods of Estimating Water Use

It follows from the previous discussion that in areas where none of the applied water becomes available for reuse, it is possible to determine the net water use directly by measuring the total water applied. On the other hand, in areas where a portion of the applied water becomes available for reuse, economic and technological limitations generally

preclude measurement of the volume of return flow of reusable water. The net water use in these areas must be determined in another manner; therefore, an indirect method is used.

Using the indirect method commonly employed, estimates of net water use are obtained by multiplying the areas of the various classes of water-using developments by appropriate average values of consumptive use of applied water. These unit values of consumptive use of applied water reflect average conditions of precipitation and the normal practices associated with urban water distribution and with irrigated agriculture. Variations from normal or average in these factors during the specific year that a land use survey is conducted may result in a difference between the estimated and actual water use during that year. Despite this possibility, it is considered that the procedures used in this survey are adequate, and that the figures on current levels of water use are reasonable. Furthermore, it is believed that these estimates of net water use are sufficiently sound to permit their use in determining the adequacy of presently available water supplies and in planning for such additional supplies as will be necessary to meet current or expected future deficiencies.

Unit Values of Water Use

During this investigation, unit values of water use derived in Bulletins No. 2 and No. 18 were reviewed to determine the applicability of the values to 1959 conditions of development. The results of this review indicated that, in general, mean seasonal unit values derived in those bulletins were still the best estimates available.

A complete discussion of the techniques employed in the derivation of unit values of water use is contained in Bulletin No. 2. Consequently, only a very general discussion of these techniques is presented here. The unit water use values are divided into the general categories of urban and suburban and irrigated agriculture use values.

Urban Water Use Values

Mean seasonal unit values of consumptive use of applied water on urban and suburban lands were derived by combining (1) estimates of the consumptive use of applied water to the area occupied by impervious cover, bare land, lawns, shrubs, etc., and (2) estimates of other urban consumptive uses, such as household use. The mean seasonal unit values of consumptive use of applied water so determined are presented in Table 11. Consumptive

TABLE 11

ESTIMATED MEAN SEASONAL UNIT VALUES OF CONSUMPTIVE USE OF APPLIED WATER ON URBAN AND SUBURBAN LANDS IN SAN LUIS OBISPO AND SANTA BARBARA COUNTIES

In feet of depth per unit of area

Hydrologic unit	:	Consumptive use of applied water
Salinas Valley	:	0.6
San Luis Obispo	:	0.8
Nipomo-Arroyo Grande Coastal	:	0.6
Arroyo Grande	:	1.1
Santa Maria River Valley	:	0.6
Cuyama River Valley	:	0.6
San Antonio Creek Valley	:	0.8
Santa Ynez River Valley	:	0.8
South Coast Basins	:	0.6
Carrizo Plain	:	0.6
Cambria Group	:	0.9
Santa Barbara County Coastal	:	0.6
San Joaquin	:	0.6



Josef Muench

Flower seed production.

LOMPOC VALLEY

use values were utilized to compute net water use for urban and suburban lands, because water applied to these lands which is not consumptively used is generally considered to be available for reuse through deep percolation or salvage. An exception is made for areas where sewage is collected and disposed to the ocean; in such areas, the net water use values were modified to account for the estimated loss through such collection and disposal.

Irrigated Agriculture Water Use Values

In Bulletin No. 2, the unit value of consumptive use of applied water for each of the irrigated crop classes was estimated by a modification of a method developed by Harry F. Blaney and Wayne D. Criddle of the United States Department of Agriculture. In the present investigation as in that bulletin, the increased use of water resulting from multiple cropping practices in some localities, was considered in estimating average unit values of water use for truck crops. The values derived for truck crops and other irrigated crops are presented in Table 12.

The values shown in Table 12 represent estimates of the average consumptive uses derived from applied water and from precipitation by the various types of irrigated agriculture. As pointed out before, in the derivation of the net water use for any given year the volume of applied water required is based on the assumption that the precipitation for the season is approximately equal to the long-time mean. However, as discussed earlier, the use of applied water in irrigated agriculture will actually be somewhat larger or smaller in individual years, generally varying inversely with the amount of rainfall. Although a similar effect

fruits				Small grain				Vineyards			
ts											
: Tot.	: Apd.	: Pre-	: Tot.	: Apd.	: Pre-	: Tot.	: Apd.	: Pre-	: Tot.	: Wtr.	: cip.
: Wtr.	: Wtr.	: cip.	: Wtr.	: Wtr.	: cip.	: Wtr.	: Wtr.	: cip.	: Wtr.	: cip.	: Wtr.
2.4	0.5	0.6	1.1	0.7	1.0	1.7					
1.9	0.1	0.9	1.0	--	--	--					
2.0	--	--	--	--	--	--					
1.8	0.3	0.7	1.0	--	--	--					
--	0.5	0.9	1.4	--	--	--					
2.3	0.5	0.7	1.2	--	--	--					
2.6	0.7	1.0	1.7	--	--	--					
2.6	0.7	1.0	1.7	--	--	--					
2.6	0.8	1.0	1.8	--	--	--					
--	--	--	--	0.7	0.7	1.4					
1.8	0.1	1.0	1.1	0.5	1.0	1.5					
2.6	0.8	1.0	1.8	--	--	--					
--	--	--	--	--	--	--					

use values were utilized to compute net water use for urban and suburban lands, because water applied to these lands which is not consumptively used is generally considered to be available for reuse through deep percolation or salvage. An exception is made for areas where sewage is collected and disposed to the ocean; in such areas, the net water use values were modified to account for the estimated loss through such collection and disposal.

Irrigated Agriculture Water Use Values

In Bulletin No. 2, the unit value of consumptive use of applied water for each of the irrigated crop classes was estimated by a modification of a method developed by Harry F. Blaney and Wayne D. Criddle of the United States Department of Agriculture. In the present investigation as in that bulletin, the increased use of water resulting from multiple cropping practices in some localities, was considered in estimating average unit values of water use for truck crops. The values derived for truck crops and other irrigated crops are presented in Table 12.

The values shown in Table 12 represent estimates of the average consumptive uses derived from applied water and from precipitation by the various types of irrigated agriculture. As pointed out before, in the derivation of the net water use for any given year the volume of applied water required is based on the assumption that the precipitation for the season is approximately equal to the long-time mean. However, as discussed earlier, the use of applied water in irrigated agriculture will actually be somewhat larger or smaller in individual years, generally varying inversely with the amount of rainfall. Although a similar effect

ESTIMATED MEAN SEASONAL UNIT VALUES OF CONSUMPTIVE USE OF WATER ON
IRRIGATED LANDS IN SAN LUIS OBISPO AND SANTA BARBARA COUNTIES

In feet of depth per unit of area

[illegible]



also occurs in the instance of urban use, variations of rainfall from year to year have less effect upon the use of applied water on urban lands than on irrigated lands.

Net Water Use

Estimates of the amount of net water use in the investigational area, under 1959 conditions of development, are presented in this section.

The estimated amounts of mean seasonal net water use in hydrologic units of San Luis Obispo and Santa Barbara Counties for conditions of 1959 are presented in Table 13. Data in this table indicate that there is essentially no net water use in the Nipomo-Arroyo Grande Unit and portions of the San Joaquin, Ventura River, and Santa Clara River Hydrologic Units. This results from the types of land use found in these units, as shown in Table 5. During the survey, no land use requiring applied water was found in these units. There are a number of military reservations in some of the hydrologic units shown on Table 13, but as explained earlier, the net water use was not determined for such reservations.

Estimated values of mean seasonal net water use for San Luis Obispo County and Santa Barbara County for conditions of 1949 are presented with data derived from the present survey in Table 14. As indicated previously, the unit values used to derive net water use represent the optimum needs of the various types of water-using developments for average conditions of rainfall and climate, and therefore provide comparable estimates which show the general level of water use. The actual level of water use may have differed from the estimated values shown on

TABLE 13

ESTIMATED LEVELS OF NET WATER USE
IN HYDROLOGIC UNITS OF SAN LUIS OBISPO
AND SANTA BARBARA COUNTIES, 1959

In acre-feet

Hydrologic unit	Irrigated lands	Urban- suburban lands	Total
Salinas Valley	33,460	3,730	37,190
San Luis Obispo	8,270	6,560	14,830
Nipomo-Arroyo Grande Coastal	---	---	---
Arroyo Grande	6,440	3,380	9,820
Santa Maria River Valley	51,620	1,760	53,380
Cuyama River Valley	23,320	1,020	24,340
San Antonio Creek Valley	3,010	1,770	4,780
Santa Ynez River Valley	28,410	3,450	31,860
South Coast Basins	13,060	11,660	24,720
Carrizo Plain	1,030	200	1,230
Cambria Group	2,170	850	3,020
Santa Barbara County Coastal	2,250	220	2,470
San Joaquin	---	50	50
Ventura River	---	---	---
Santa Clara River	---	---	---
TOTAL INVESTIGATIONAL AREA	173,040	34,650	207,690

Table 14 because of variations from the mean precipitation, or the undetermined demand in military reservations.

TABLE 14

ESTIMATED LEVELS OF NET WATER USE IN
SAN LUIS OBISPO AND SANTA BARBARA
COUNTIES IN 1949 AND 1959

In acre-feet

County	1949	1959	Difference
<u>San Luis Obispo</u>			
Irrigated lands	39,400	75,400	36,000
Urban-suburban areas	<u>4,300</u>	<u>15,000</u>	<u>10,700</u>
Subtotals	43,700	90,400	46,700
<u>Santa Barbara</u>			
Irrigated lands	114,100	96,100	-18,000
Urban-suburban areas	<u>9,200</u>	<u>19,400</u>	<u>10,200</u>
Subtotals	123,300	115,500	- 7,800
Total irrigated lands	153,500	171,500	18,000
Total urban-suburban areas	<u>13,500</u>	<u>34,450</u>	<u>20,900</u>
TOTALS	167,000	205,900	38,900

Averages of data from representative precipitation stations located in the investigational area indicate that the rainfall during 1949 was about 65 percent of normal for the 50-year period 1897-98 through 1946-47 while values for 1959 were about 60 percent of normal. Therefore, the estimates of levels of net water use shown in Tables 13 and 14 are probably somewhat below the actual net water use, but the differences shown in Table 14 are believed to be reasonable estimates of the increase in water use.

The data presented in Table 14 indicate that the changes in net water use between 1949 and 1959 generally reflect the changes in land use in the area of investigation as described in Chapter III. There was a substantial upsurge in net water use throughout the entire area of investigation, increasing about 23 percent during this period. The increase was roughly evenly divided between urban and agriculture uses, although the latter was much greater on a percentage basis, 155 percent. The increase in urban use was approximately evenly divided between the two counties. However, there was a very large decrease in agricultural use in Santa Barbara County, primarily as a result of the conversion of much truck acreage to urban development. This decrease is so large that the total effect is an overall decrease in net water use in that county.

The decrease in net water use described above points up a major factor in the concept of determining needs for water by the net water use method used herein, that is, the consideration of the disposition of the unconsumed portion of the applied water. The delivery requirements or duty for urban residential development and for most agricultural crops are usually considered to be roughly equal. Approximately one-half of the water delivered to urban culture is used for interior household purposes and essentially all of this is disposed as sewage and is not consumed. Where the sewage is disposed to a system which discharges to the ocean, the water is considered to be irrecoverably lost and therefore is included in the net water use. However, if the sewage is disposed in such a manner as to be available for reuse it is not included in the net water use, with the result that the net water use is less than on a comparable acreage of an agricultural crop.

In comparing the net water use in Santa Barbara County between 1949 and 1959, the change from agricultural to urban acreage is very large and is believed to be a major factor in the indicated decline in net water use in Santa Barbara County during the period. As urbanization of Santa Barbara County continues, it is probable that problems of sanitation will dictate the need for the development of sewerage systems with ocean outfalls. As a result, the net water use will again be approximately equal to that which existed under the earlier agrarian culture.

Comparison of Water Supply and Water Use

The amounts of net water use determined from land use surveys in San Luis Obispo and Santa Barbara Counties in 1949 and 1959 are shown in Table 15, together with the approximate safe yield of local supplies derived in Chapter II. The forecast net water requirement for the years 1980, 2000 and 2020 for the area of investigation, except for the Carrizo Plain and Cuyama Valley Units, as derived from studies for Bulletin No. 78, is also presented in Table 15.

The data presented in Table 15 indicate that net water use has increased during the period 1949-1959, and will continue to increase through 2020. However, the development of local supplies through such projects as Twitchell, Cachuma and Whale Rock Reservoirs has provided water to meet the increasing demand, and as indicated in Chapter II, additional water supplies can be developed in the area of investigation, primarily in San Luis Obispo County. Estimates presented in Bulletin No. 78 indicate that additional developable water is on the order of 110,000 acre-feet, assuming that such total development is both economically and financially feasible.

TABLE 15

COMPARISON OF NET WATER USE AND WATER SUPPLY
FOR SAN LUIS OBISPO AND SANTA BARBARA COUNTIES

In acre-feet

Year	Net water use	Approximate safe yield of local supplies	Excess of water use over mean annual net local water supply
1949	167,000	190,000	---
1959	205,900	268,000	---
1980	301,000 ^{a,b}	309,000 ^b	---
2000	440,000 ^{a,b}	354,000 ^b	86,000
2020	591,000 ^{a,b}	370,000 ^b	221,000

a. Net water requirement.

b. Excludes Carrizo Plain and Cuyama River Valley Hydrologic Units.

Projections of future net water use and the projected rate of local water supply development, presented in Table 15, indicate that supplemental water must be imported to these counties by about 1980. Therefore, the subject counties have contracted for water from the State Water Project. However, the availability of water from local water supplies means that the date of initial delivery of water from the state facilities need not be prior to about 1980.

CHAPTER V. SUMMARY AND CONCLUSIONS

The results of the 1959 land and water use survey of San Luis Obispo and Santa Barbara Counties, comparisons with previous surveys of the counties, and conclusions drawn from this study are summarized in this chapter.

Summary

This investigation disclosed that the following land uses and water requirements existed in the area of investigation:

1. A total of 151,400 acres, or about 4 percent of all lands within San Luis Obispo and Santa Barbara Counties, had been developed for urban and suburban or irrigated agricultural uses by 1959. This is an increase of about 29 percent over similar water-using developments that existed in 1949. About 58,900 acres of this development took place in San Luis Obispo County, and about 92,500 acres took place in Santa Barbara County. In San Luis Obispo County, this is an increase of 88 percent over that which existed in 1949; the increase in Santa Barbara County was about 7 percent over the 1949 acreage.
2. The gross urban and suburban area for San Luis Obispo County in 1959 was 16,600 acres, an increase of about 11,500 acres, or 225 percent, over that which existed in 1949. The extent of this land use in Santa Barbara County in 1959 was 25,800 acres,

an increase of about 15, 900 acres, or 160 percent, over 1949. These increases were a direct result of increases in population in the two counties. The population of San Luis Obispo County increased from 51,420 in 1950 to 81,040 in 1960; that of Santa Barbara County rose from 98,220 in 1950 to 168,960 in 1960. The gross 1959 urban and suburban area in the two counties, excluding the Carrizo Plain and Cuyama Valley, equaled about 40,600 acres, or 21 percent, of the 193,000 acres forecast in Bulletin No. 78 to be developed to this category of land use by the year 2020.

3. The gross irrigated agricultural acreage in San Luis Obispo County increased from 26,200 acres in 1949 to 42,400 acres in 1959, or about 62 percent, while the acreage of this land use category in Santa Barbara County decreased substantially from 76,200 acres to 66,700 acres, or 12 percent, during the same period. The net irrigated agricultural acreage for San Luis Obispo and Santa Barbara Counties, excluding the Carrizo Plain and Cuyama Valley, was about 84,600 acres in 1959. This is about 65 percent of the 131,000 acres which were forecast in Bulletin No. 78 to be developed for this use by the year 2020.
4. The estimated 1959 mean seasonal net water use by these water-using developments in San Luis Obispo County was

about 90,400 acre-feet, which is an increase of approximately 69 percent over the 1949 estimated net water use. The estimated 1959 net water use in Santa Barbara County was about 115,500 acre-feet, which is a decrease of about 7,800 acre-feet, or 6 percent, from the 1949 level. This decrease resulted from the change in land use from irrigated agriculture to urban and suburban use in this county.

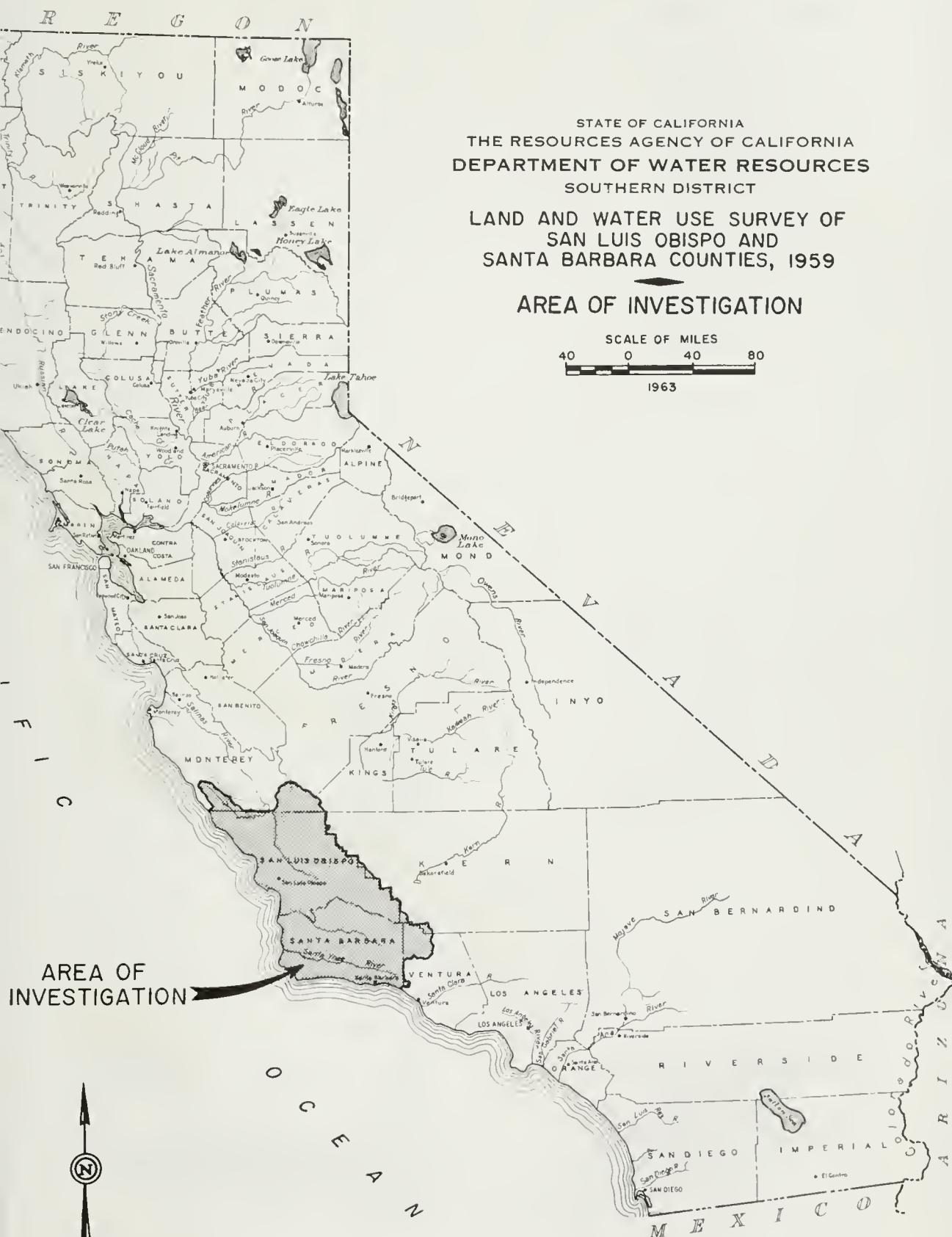
5. While the total net water use in the two counties has increased during the period 1949 to 1959, the development of local supplies has provided water to meet the increasing demand. Additional water is available for development, primarily in San Luis Obispo County, to satisfy the increasing demands until about 1980, the date when initial deliveries of imported water through the State Water Project are anticipated.
6. The estimated total seasonal water requirement for the two counties, excluding the Carrizo Plain and Cuyama River areas, by the year 2020 has been estimated to be on the order of 591,000 acre-feet. Of this requirement, approximately 221,000 acre-feet must be derived by importing supplies from outside the area of investigation.

Conclusions

Based on the results of this investigation, it is concluded

that:

1. Economic and climatic factors have established a rapid rate of growth in population in the area of investigation, and this growth will probably continue in the foreseeable future, if adequate water supplies are available.
2. A large volume of water imported to the area will be required to meet the anticipated growth.
3. The land uses, water requirements, and growth trends established by this study should be monitored and re-evaluated by future land use surveys in order that the water supplies required to support the projected growth can be adequately planned and developed.





MAJOR WATER AGENCIES

MUNICIPAL SERVICE AREAS

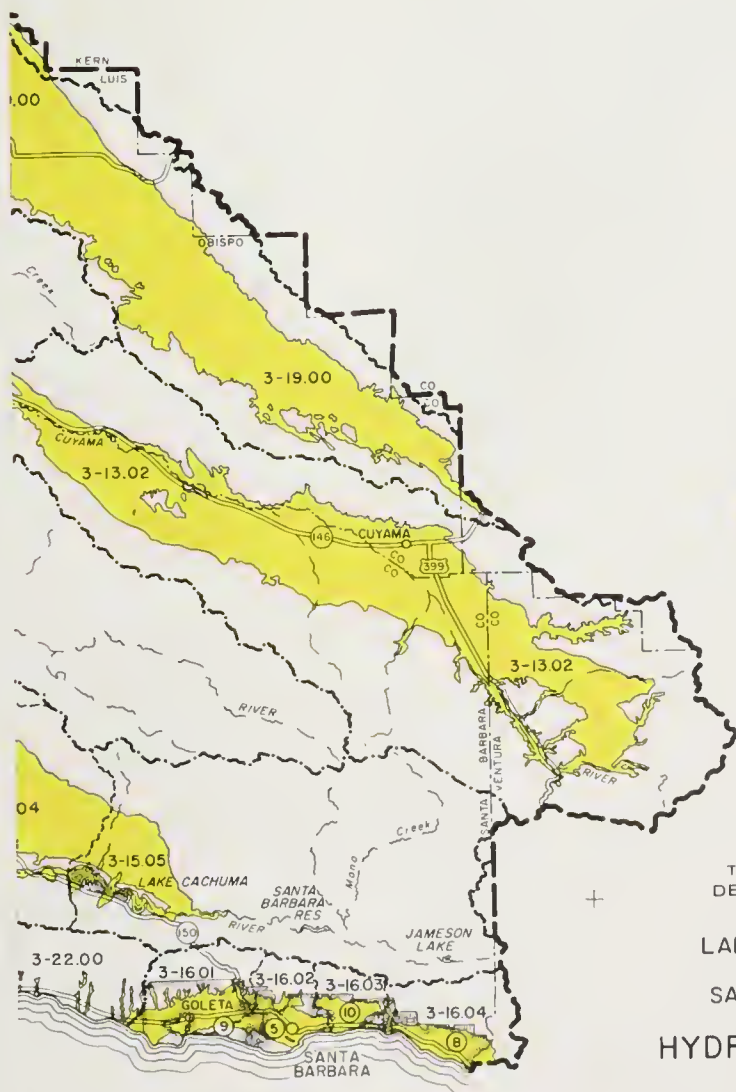
- ① ARROYO GRANDE
- ② LOMPOC
- ③ PASO ROBLES
- ④ SAN LUIS OBISPO
- ⑤ SANTA BARBARA
- ⑥ SANTA MARIA

COUNTY WATER DISTRICTS

- ⑦ ATASCAERO
- ⑧ CARPINTERIA
- ⑨ GOLETA
- ⑩ MONTECITO

LEGEND

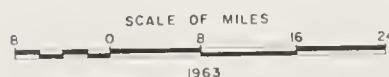
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- BOUNDARY OF HYDROLOGIC AREA
- BOUNDARY OF HYDROLOGIC UNIT
- - - BOUNDARY OF HYDROLOGIC SUBUNITS
- BOUNDARY OF MAJOR WATER SERVICE AREAS
- 3 - 4 06 GROUND WATER BASIN NUMBERS
- WATER-BEARING SEIMENTS



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DEPARTMENT OF WATER RESOURCES
SOUTHERN DISTRICT

LAND AND WATER USE SURVEY OF
SAN LUIS OBISPO AND
SANTA BARBARA COUNTIES, 1959

HYDROLOGIC UNITS, SUBUNITS
AND
MAJOR WATER AGENCIES





NUMERICAL DESIGNATION OF HYDROLOGIC UNITS AND SUBUNITS

3-4 00	Salinas Valley Unit
3-4 06	Paso Robles Subunit
3-4 07	Pazo Subunit
3-8 00	San Luis Obispo Unit
3-8 01	Morro Subunit
3-8 02	Charro Subunit
3-8 03	Los Osos Subunit
3-8 04	San Luis Obispo Subunit
3-8 05	Pismo Subunit
3-8 06	San Luis Coastal Subunit
3-10 00	Nipoma-Arroyo Grande Coastal Unit
3-11 00	Arroyo Grande Unit
3-11 01	Arroyo Grande Subunit
3-11 11	Nipoma Meso Surface Drainage Tributary to Arroyo Grande Subunit
3-11 02	Nipoma Meso Subunit
3-12 00	Santa Maria River Valley Unit
3-12 01	Santa Maria Subunit
3-12 02	Sisquoc Subunit
3-13 00	Cuyamo River Valley Unit
3-13 01	Twitchell Subunit
3-13 02	Cuyamo Subunit
3-14 00	San Antonio Creek Valley Unit
3-15 00	Santa Ynez River Valley Unit
3-15 01	Lompoc Subunit
3-15 02	Santa Rita Subunit
3-15 03	Buellton Subunit
3-15 04	Santa Ynez Subunit
3-15 05	Headwater Subunit
3-16 00	South Coast Basins Unit
3-16 01	Goleta Subunit
3-16 02	Santa Barbara Subunit
3-16 03	Montecito Subunit
3-16 04	Carpinteria Subunit
3-19 00	Carrizo Plain Unit
3-21 00	Cambria Group Unit
3-21 01	San Carpoforo Subunit
3-21 02	Arroyo de la Cruz Subunit
3-21 03	San Simeon Subunit
3-21 04	Santa Rosa Subunit
3-21 05	Villo Subunit
3-21 06	Coyucos Subunit
3-21 07	Old Subunit
3-21 08	Toro Subunit
3-22 00	Santa Barbara County Coastal Unit

MAJOR WATER AGENCIES

MUNICIPAL SERVICE AREAS

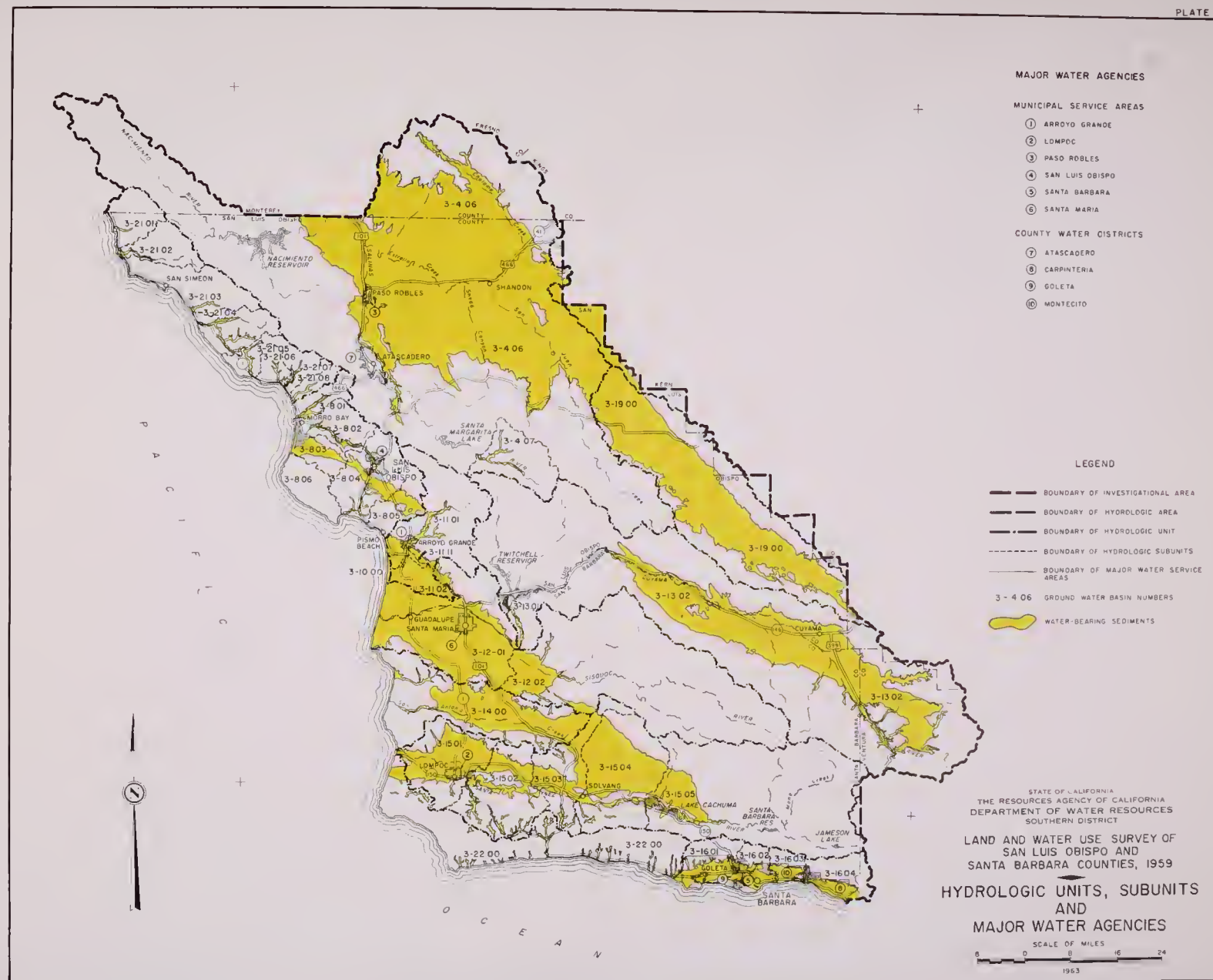
- ① ARROYO GRANDE
- ② LOMPOC
- ③ PASO ROBLES
- ④ SAN LUIS OBISPO
- ⑤ SANTA BARBARA
- ⑥ SANTA MARIA

COUNTY WATER DISTRICTS

- ⑦ ATASCADERO
- ⑧ CARPINTERIA
- ⑨ GOLETA
- ⑩ MONTECITO

LEGEND

- BOUNDARY OF INVESTIGATIONAL AREA
- BOUNDARY OF HYDROLOGIC AREA
- BOUNDARY OF HYDROLOGIC UNIT
- BOUNDARY OF HYDROLOGIC SUBUNITS
- BOUNDARY OF MAJOR WATER SERVICE AREAS
- 3-4 06 GROUND WATER BASIN NUMBERS
- WATER-BEARING SEDIMENTS







LOCATION MAP

LEGEND

- BOUNDARY OF INVESTIGATIONAL AREA
- BOUNDARY OF HYDROLOGIC AREA
- BOUNDARY OF HYDROLOGIC UNIT
- BOUNDARY OF NATIONAL FOREST
- IRRIGATED AGRICULTURE
- URBAN RESIDENTIAL
- COMMERCIAL
- INDUSTRIAL-MANUFACTURING AND PROCESSING
- INDUSTRIAL-EXTRACTIVE, STORAGE, AND TRANSPORTATION
- MILITARY RESERVATIONS
- 3-8** HYDROLOGIC UNIT NUMBER



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LAND AND WATER USE SURVEY OF
SAN LUIS OBISPO AND
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PRESENT LAND USE



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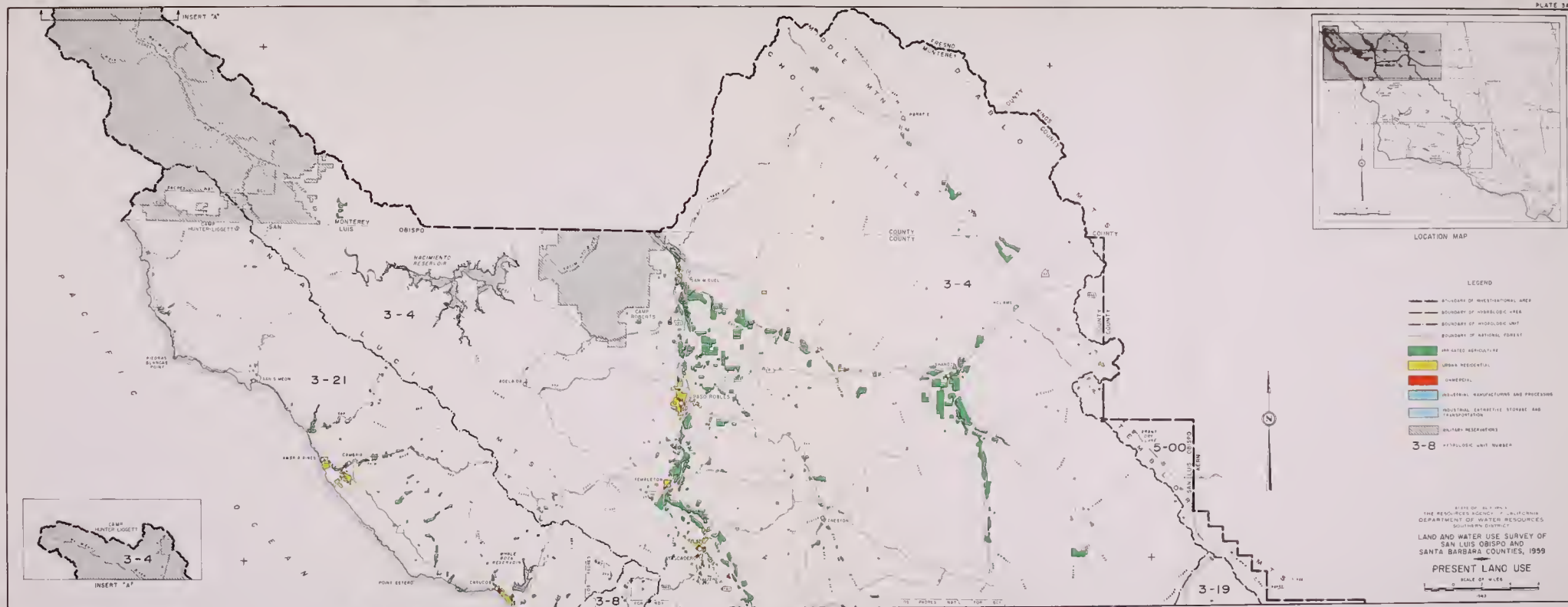
HYDROLOGIC AREAS AND UNITS

3-0 PORTION OF CENTRAL COASTAL HYDROLOGIC AREA

- 3-4 SALINAS VALLEY
- 3-8 SAN LUIS OBISPO
- 3-10 NIPOMO-ARROYO GRANDE COASTAL
- 3-11 ARROYO GRANDE
- 3-12 SANTA MARIA RIVER VALLEY
- 3-13 CUYAMA RIVER VALLEY
- 3-14 SAN ANTONIO CREEK VALLEY
- 3-15 SANTA YNEZ RIVER VALLEY
- 3-16 SOUTH COAST BASINS
- 3-19 CARRIZO PLAIN
- 3-21 CAMBRIA GROUP
- 3-22 SANTA BARBARA COUNTY COASTAL

4-0 PORTION OF LOS ANGELES HYDROLOGIC AREA

5-0 PORTION OF SAN JOAQUIN VALLEY



THE HISTORY OF THE

REIGN OF

THE GREAT KING OF GREAT BRITAIN

BY

JOHN HANCOCK

OF THE UNIVERSITY OF CAMBRIDGE

IN TWO VOLUMES

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THE HISTORY OF THE

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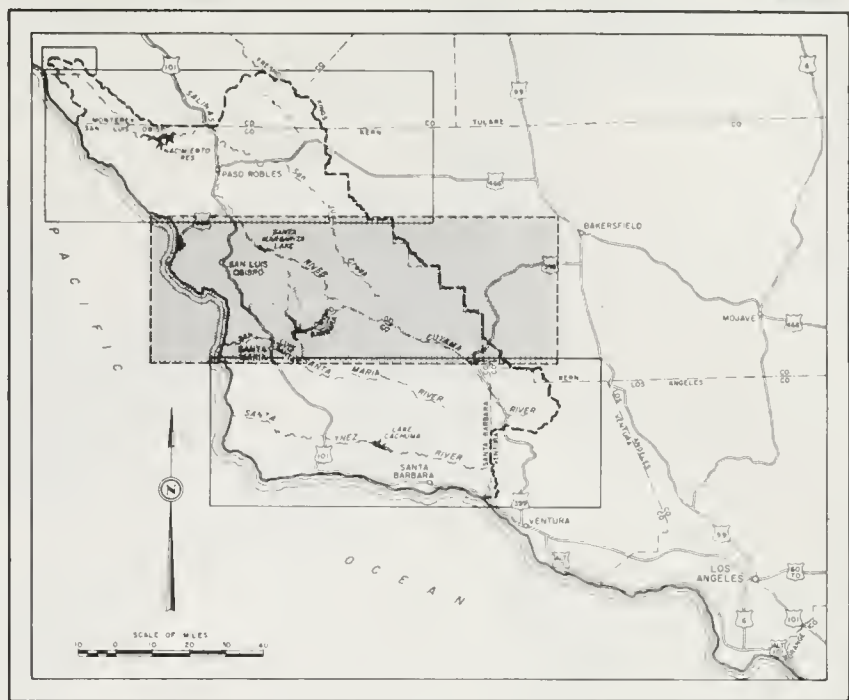
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OF THE UNIVERSITY OF CAMBRIDGE

IN TWO VOLUMES

THE HISTORY OF THE

REIGN OF



LOCATION MAP

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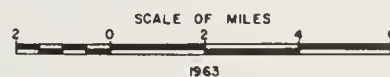
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- - - BOUNDARY OF HYDROLOGIC UNIT
- - - BOUNDARY OF NATIONAL FOREST
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- INDUSTRIAL-MANUFACTURING AND PROCESSING
- INDUSTRIAL-EXTRACTIVE, STORAGE, AND TRANSPORTATION
- ▨ MILITARY RESERVATIONS
- 3-8 HYDROLOGIC UNIT NUMBER



STATE OF CALIFORNIA
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LAND AND WATER USE SURVEY OF
SAN LUIS OBISPO AND
SANTA BARBARA COUNTIES, 1959

PRESENT LAND USE



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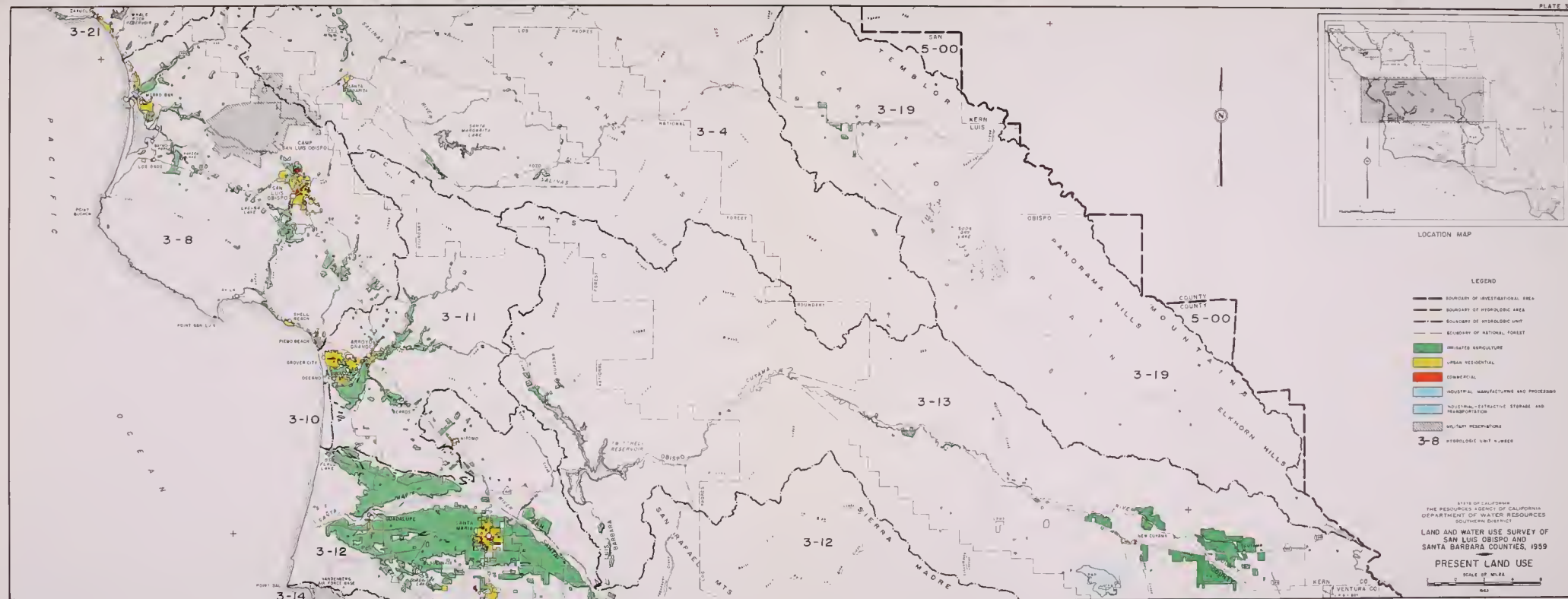
HYDROLOGIC AREAS AND UNITS

3-0 PORTION OF CENTRAL COASTAL HYDROLOGIC AREA

- 3-4 SALINAS VALLEY
- 3-8 SAN LUIS OBISPO
- 3-10 NIPOMO-ARROYO GRANDE COASTAL
- 3-11 ARROYO GRANDE
- 3-12 SANTA MARIA RIVER VALLEY
- 3-13 CUYAMA RIVER VALLEY
- 3-14 SAN ANTONIO CREEK VALLEY
- 3-15 SANTA YNEZ RIVER VALLEY
- 3-16 SOUTH COAST BASINS
- 3-19 CARRIZO PLAIN
- 3-21 CAMBRIA GROUP
- 3-22 SANTA BARBARA COUNTY COASTAL

4-0 PORTION OF LOS ANGELES HYDROLOGIC AREA

5-0 PORTION OF SAN JOAQUIN VALLEY



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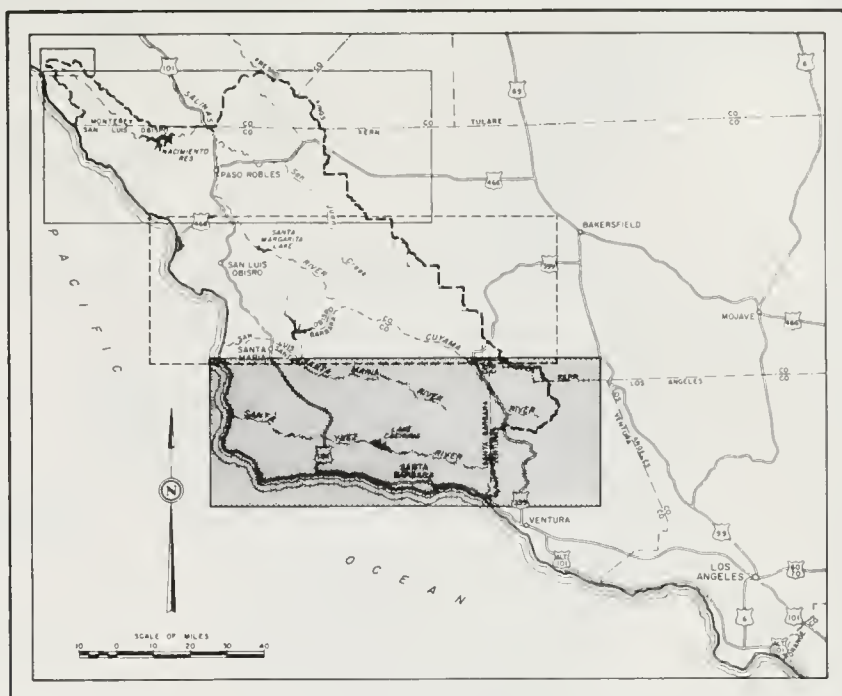
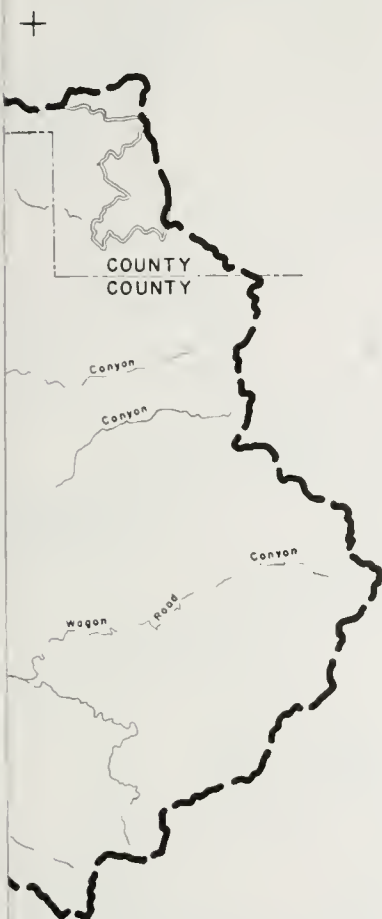
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LOCATION MAP

LEGEND

- BOUNDARY OF INVESTIGATIONAL AREA
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- MILITARY RESERVATIONS

3-11 HYDROLOGIC UNIT NUMBER

STATE OF CALIFORNIA
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SOUTHERN DISTRICT

LAND AND WATER USE SURVEY OF
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HYDROLOGIC AREAS AND UNITS

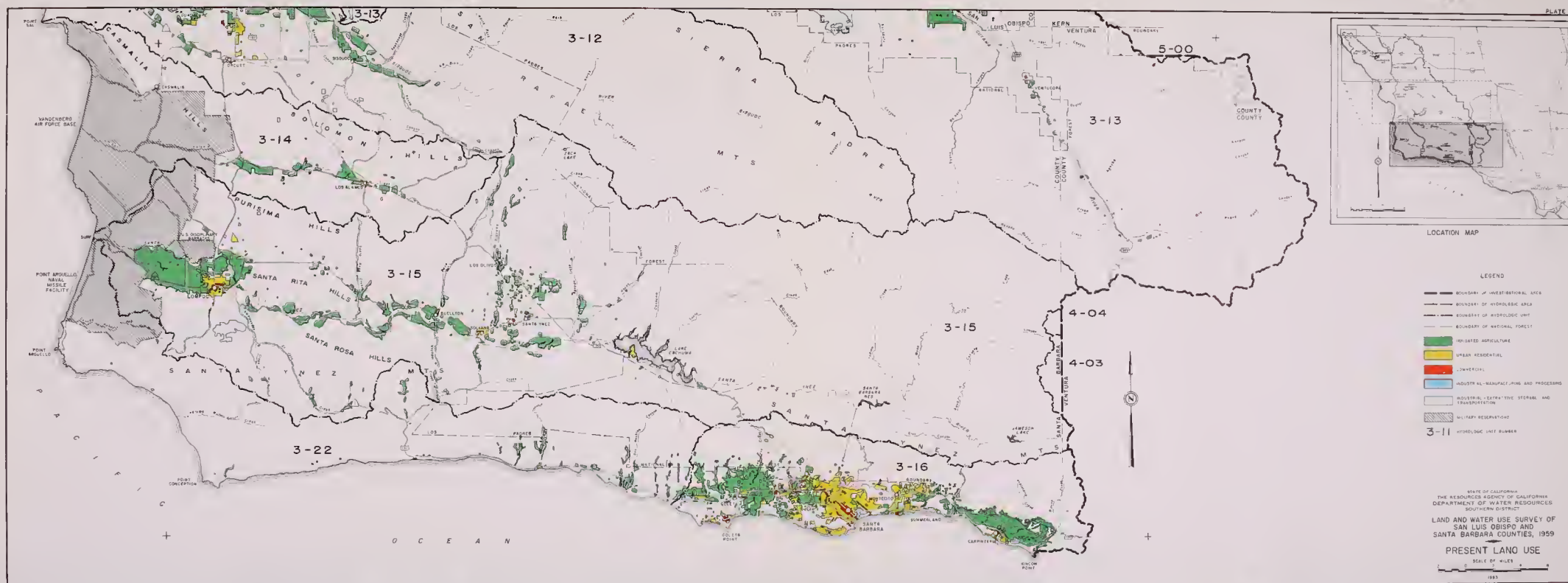
3-0 PORTION OF CENTRAL COASTAL HYDROLOGIC AREA

- 3-4 SALINAS VALLEY
- 3-8 SAN LUIS OBISPO
- 3-10 NIPOMO-ARROYO GRANDE COASTAL
- 3-11 ARROYO GRANDE
- 3-12 SANTA MARIA RIVER VALLEY
- 3-13 CUYAMA RIVER VALLEY
- 3-14 SAN ANTONIO CREEK VALLEY
- 3-15 SANTA YNEZ RIVER VALLEY
- 3-16 SOUTH COAST BASINS
- 3-19 CARRIZO PLAIN
- 3-21 CAMBRIA GROUP
- 3-22 SANTA BARBARA COUNTY COASTAL

4-0 PORTION OF LOS ANGELES HYDROLOGIC AREA

- 4-03 VENTURA RIVER
- 4-04 SANTA CLARA RIVER

5-0 PORTION OF SAN JOAQUIN VALLEY



- LEGEND
- BOUNDARY OF INVESTIGATIONAL AREA
 - BOUNDARY OF HYDROLOGIC AREA
 - BOUNDARY OF HYDROLOGIC UNIT
 - BOUNDARY OF NATIONAL FOREST
 - MODIFIED AGRICULTURE
 - URBAN RESIDENTIAL
 - INDUSTRIAL
 - INDUSTRIAL-MANUFACTURING AND PROCESSING
 - INDUSTRIAL-ENTERPRISE STORAGE AND TRANSPORTATION
 - MILITARY RESERVATIONS
 - 3-11 HYDROLOGIC UNIT NUMBER

STATE OF CALIFORNIA
THE RESOURCES AGENCY OF CALIFORNIA
DEPARTMENT OF WATER RESOURCES
SOUTHERN DISTRICT
LAND AND WATER USE SURVEY OF
SAN LUIS OBISPO AND
SANTA BARBARA COUNTIES, 1959
PRESENT LAND USE
SCALE OF MILES
1959

THE HISTORY OF THE

THE HISTORY OF THE

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LOCATION MAP

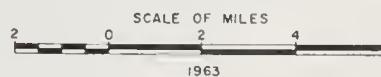
LEGEND

- BOUNDARY OF INVESTIGATIONAL AREA
- BOUNDARY OF HYDROLOGIC AREA
- • — BOUNDARY OF HYDROLOGIC UNIT
- BOUNDARY OF NATIONAL FOREST
- IRRIGATED AGRICULTURAL EXPANSION AREAS
- URBAN AND SUBURBAN EXPANSION AREAS
- ▨ MILITARY RESERVATIONS
- 3-8 HYDROLOGIC UNIT NUMBER

STATE OF CALIFORNIA
THE RESOURCES AGENCY OF CALIFORNIA
DEPARTMENT OF WATER RESOURCES
SOUTHERN DISTRICT

LAND AND WATER USE SURVEY OF
SAN LUIS OBISPO AND
SANTA BARBARA COUNTIES, 1959

CHANGE IN LAND USE
SAN LUIS OBISPO COUNTY
1953 TO 1959



APPENDIX - continued

NO. OF SPECIMENS

1950-1951

1952-1953

1954-1955

1956-1957

1958-1959

1960-1961

1962-1963

1964-1965

1966-1967

1968-1969

1970-1971

1972-1973

1974-1975

1976-1977

1978-1979

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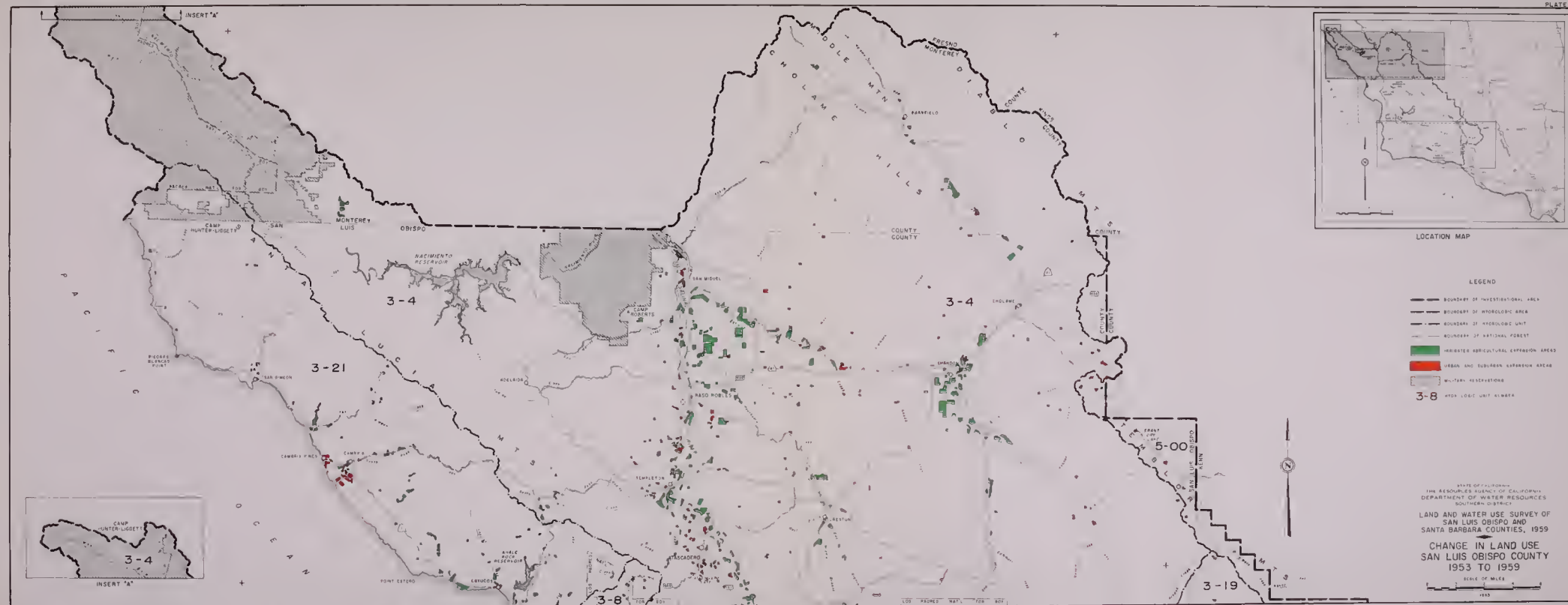
HYDROLOGIC AREAS AND UNITS

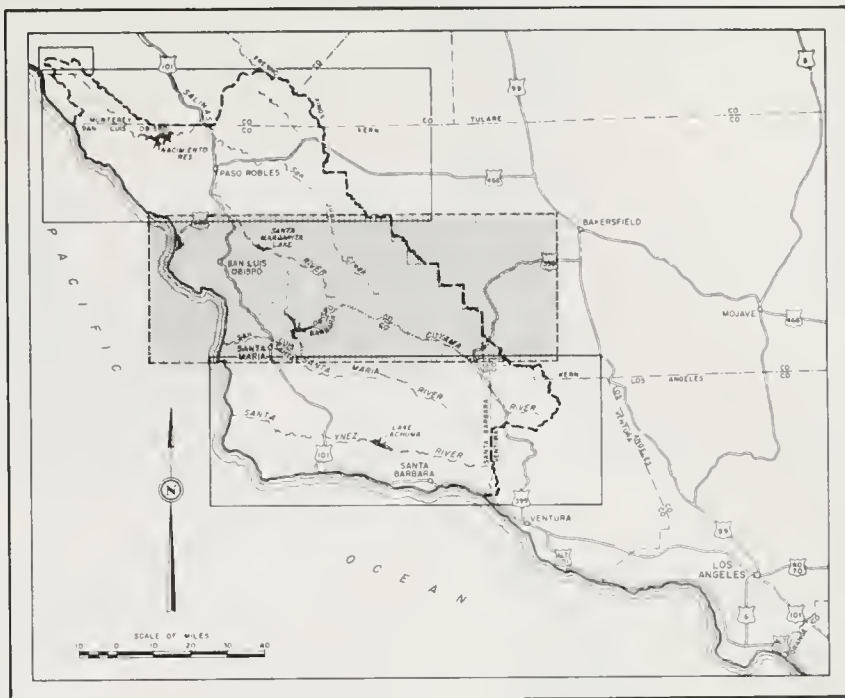
3-0 PORTION OF CENTRAL COASTAL HYDROLOGIC AREA

- 3-4 SALINAS VALLEY
- 3-8 SAN LUIS OBISPO
- 3-10 NIPOMO-ARROYO GRANDE COASTAL
- 3-11 ARROYO GRANDE GROUP
- 3-12 SANTA MARIA RIVER VALLEY
- 3-13 CUYAMA RIVER VALLEY
- 3-14 SAN ANTONIO CREEK VALLEY
- 3-15 SANTA YNEZ RIVER VALLEY
- 3-16 SOUTH COAST BASINS
- 3-19 CARRIZO PLAIN
- 3-21 CAMBRIA GROUP
- 3-22 SANTA BARBARA COUNTY COASTAL GROUP

4-0 PORTION OF LOS ANGELES HYDROLOGIC AREA

5-0 PORTION OF SAN JOAQUIN VALLEY





LOCATION MAP

LEGEND

- BOUNDARY OF INVESTIGATIONAL AREA
- BOUNDARY OF HYDROLOGIC AREA
- BOUNDARY OF HYDROLOGIC UNIT
- BOUNDARY OF NATIONAL FOREST
- IRRIGATED AGRICULTURAL EXPANSION AREAS
- URBAN AND SUBURBAN EXPANSION AREAS
- ▨ MILITARY RESERVATIONS
- 3-8 HYDROLOGIC UNIT NUMBER



STATE OF CALIFORNIA
THE RESOURCES AGENCY OF CALIFORNIA
DEPARTMENT OF WATER RESOURCES
SOUTHERN DISTRICT

LAND AND WATER USE SURVEY OF
SAN LUIS OBISPO AND
SANTA BARBARA COUNTIES, 1959

CHANGE IN LAND USE
SAN LUIS OBISPO COUNTY
1953 TO 1959
AND
SANTA BARBARA COUNTY
1949 TO 1959

SCALE OF MILES
2 0 2 4 6
1963

THE HISTORY OF THE

REIGN OF

CHARLES

THE FIRST

OF GREAT BRITAIN

AND

IRLAND

BY

JOHN

WILKINS

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Printed by

W. BENTLEY

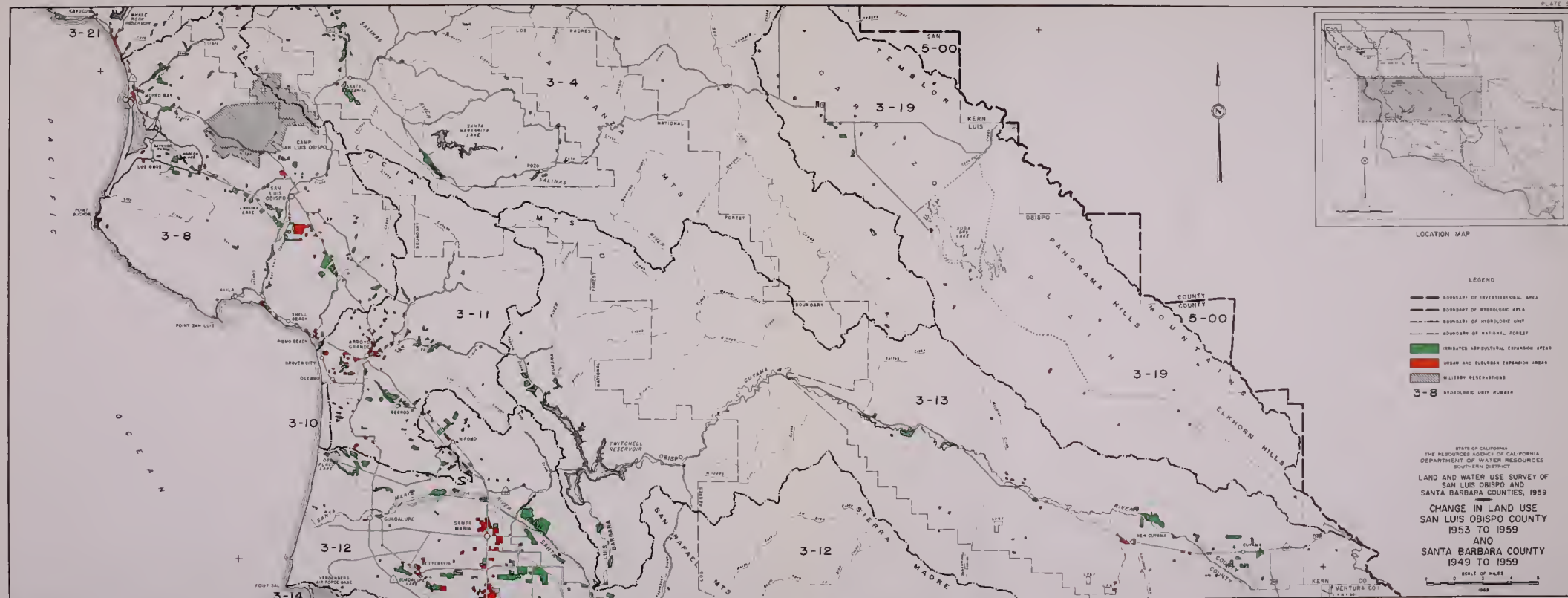
HYDROLOGIC AREAS AND UNITS

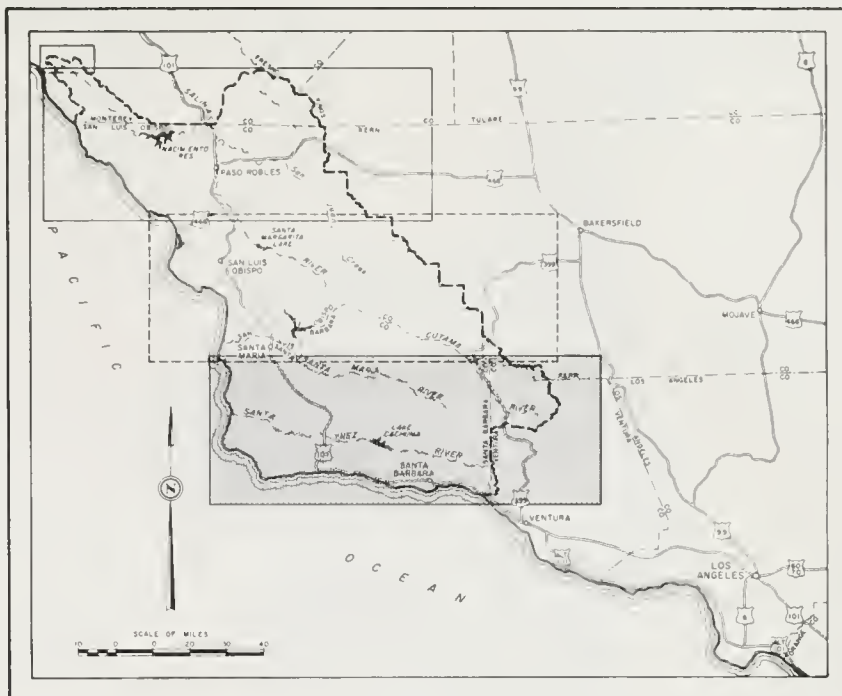
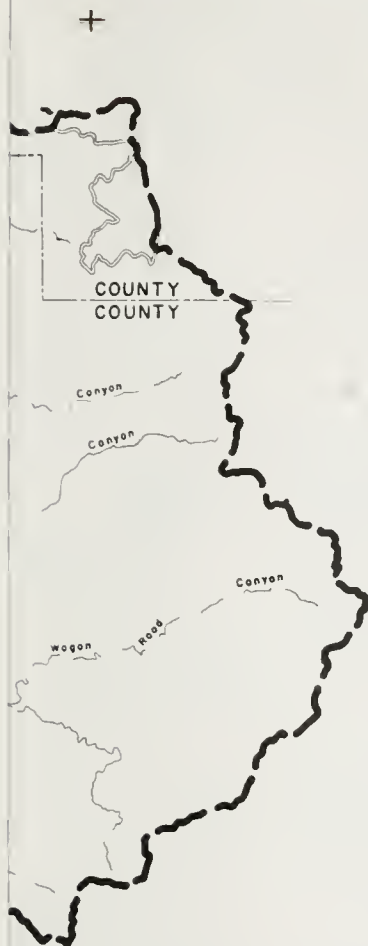
3-0 PORTION OF CENTRAL COASTAL HYDROLOGIC AREA

- 3-4 SALINAS VALLEY
- 3-8 SAN LUIS OBISPO
- 3-10 NIPOMO-ARROYO GRANDE COASTAL
- 3-11 ARROYO GRANDE
- 3-12 SANTA MARIA RIVER VALLEY
- 3-13 CUYAMA RIVER VALLEY
- 3-14 SAN ANTONIO CREEK VALLEY
- 3-15 SANTA YNEZ RIVER VALLEY
- 3-16 SOUTH COAST BASINS
- 3-19 CARRIZO PLAIN
- 3-21 CAMBRIA GROUP
- 3-22 SANTA BARBARA COUNTY COASTAL

4-0 PORTION OF LOS ANGELES HYDROLOGIC AREA

5-0 PORTION OF SAN JOAQUIN VALLEY





LOCATION MAP

LEGEND

- BOUNDARY OF INVESTIGATIONAL AREA
- BOUNDARY OF HYDROLOGIC AREA
- BOUNDARY OF HYDROLOGIC UNIT
- BOUNDARY OF NATIONAL FOREST
- IRRIGATED AGRICULTURAL EXPANSION AREAS
- URBAN AND SUBURBAN EXPANSION AREAS
- ▨ MILITARY RESERVATIONS

3-11 HYDROLOGIC UNIT NUMBER

STATE OF CALIFORNIA
THE RESOURCES AGENCY OF CALIFORNIA
DEPARTMENT OF WATER RESOURCES
SOUTHERN DISTRICT

LAND AND WATER USE SURVEY OF
SAN LUIS OBISPO AND
SANTA BARBARA COUNTIES, 1959

CHANGE IN LAND USE
SAN LUIS OBISPO COUNTY
1953 TO 1959
AND
SANTA BARBARA COUNTY
1949 TO 1959



1963

THE UNIVERSITY OF CHICAGO

THE UNIVERSITY OF CHICAGO

THE UNIVERSITY OF CHICAGO

THE UNIVERSITY OF CHICAGO

THE UNIVERSITY OF CHICAGO

THE UNIVERSITY OF CHICAGO

HYDROLOGIC AREAS AND UNITS

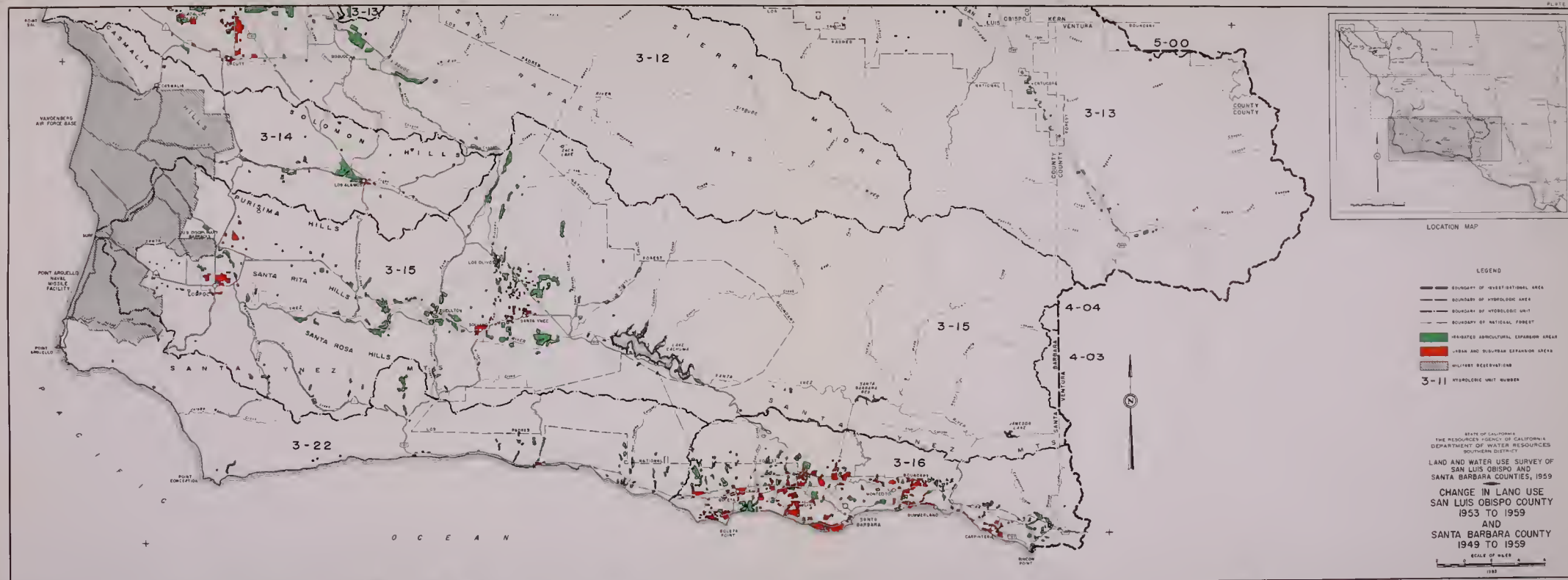
3-0 PORTION OF CENTRAL COASTAL HYDROLOGIC AREA

- 3-4 SALINAS VALLEY
- 3-8 SAN LUIS OBISPO
- 3-10 NIPOMO-ARROYO GRANDE COASTAL
- 3-11 ARROYO GRANDE
- 3-12 SANTA MARIA RIVER VALLEY
- 3-13 CUYAMA RIVER VALLEY
- 3-14 SAN ANTONIO CREEK VALLEY
- 3-15 SANTA YNEZ RIVER VALLEY
- 3-16 SOUTH COAST BASINS
- 3-19 CARRIZO PLAIN
- 3-21 CAMBRIA GROUP
- 3-22 SANTA BARBARA COUNTY COASTAL

4-0 PORTION OF LOS ANGELES HYDROLOGIC AREA

- 4-03 VENTURA RIVER
- 4-04 SANTA CLARA RIVER

5-0 PORTION OF SAN JOAQUIN VALLEY





APPENDIX A
DEFINITION OF TERMS



APPENDIX A

DEFINITION OF TERMS

Annual - The 12-month period from January 1 of a given year through

December 31 of the same year, sometimes termed the "calendar year."

Applied Water - Water delivered to a farmer's headgate, in the case of

irrigation use, or to an individual's meter in the case of urban use,

or its equivalent. Applied water does not include direct precipitation.

Applied Water Requirement - The applied water needed to provide for all

beneficial uses and for irrecoverable losses incidental to such uses.

Applied water requirement excludes that portion of the total water requirement which is provided by precipitation.

Aquifer - A geologic formation or structure sufficiently permeable to yield

water to wells or springs.

Average - An arithmetical average relating to a period other than a mean

period.

Confined Ground Water - A body of ground water immediately overlain by

material sufficiently impervious to sever free hydraulic connection

with overlying water, and acted upon by pressure caused by the difference

in head between the intake or forebay area and the discharge area

of the confined water body.

Consumptive Use of Water - Water consumed by vegetative growth in transpiration

and building plant tissue, and water evaporated from adjacent soil,

from water surface, and from foliage. It also refers to water similarly

consumed and evaporated by urban and nonvegetative types of land use.

Free Ground Water - A body of ground water not immediately overlain by impervious materials.

Ground Water Overdraft - The annual net extraction of water from a ground water basin in excess of safe ground water yield.

Irrigation Efficiency - The ratio of consumptive use of applied irrigation water to the total amount of water applied, expressed as a percentage.

Mean - An arithmetical average relating to a mean period.

Mean Period - A period chosen to represent conditions of water supply and climate over a long series of years. For purposes of the current investigation, the mean precipitation period embraces the 50 seasons from 1897-98 through 1946-47; the mean runoff period, the 53 seasons from 1894-95 through 1946-47.

Net Water Use - Water historically applied, or estimated to have been applied, which is consumptively utilized for beneficial purposes or irrecoverably lost. It does not include that portion of the applied water which is subject to possible reuse.

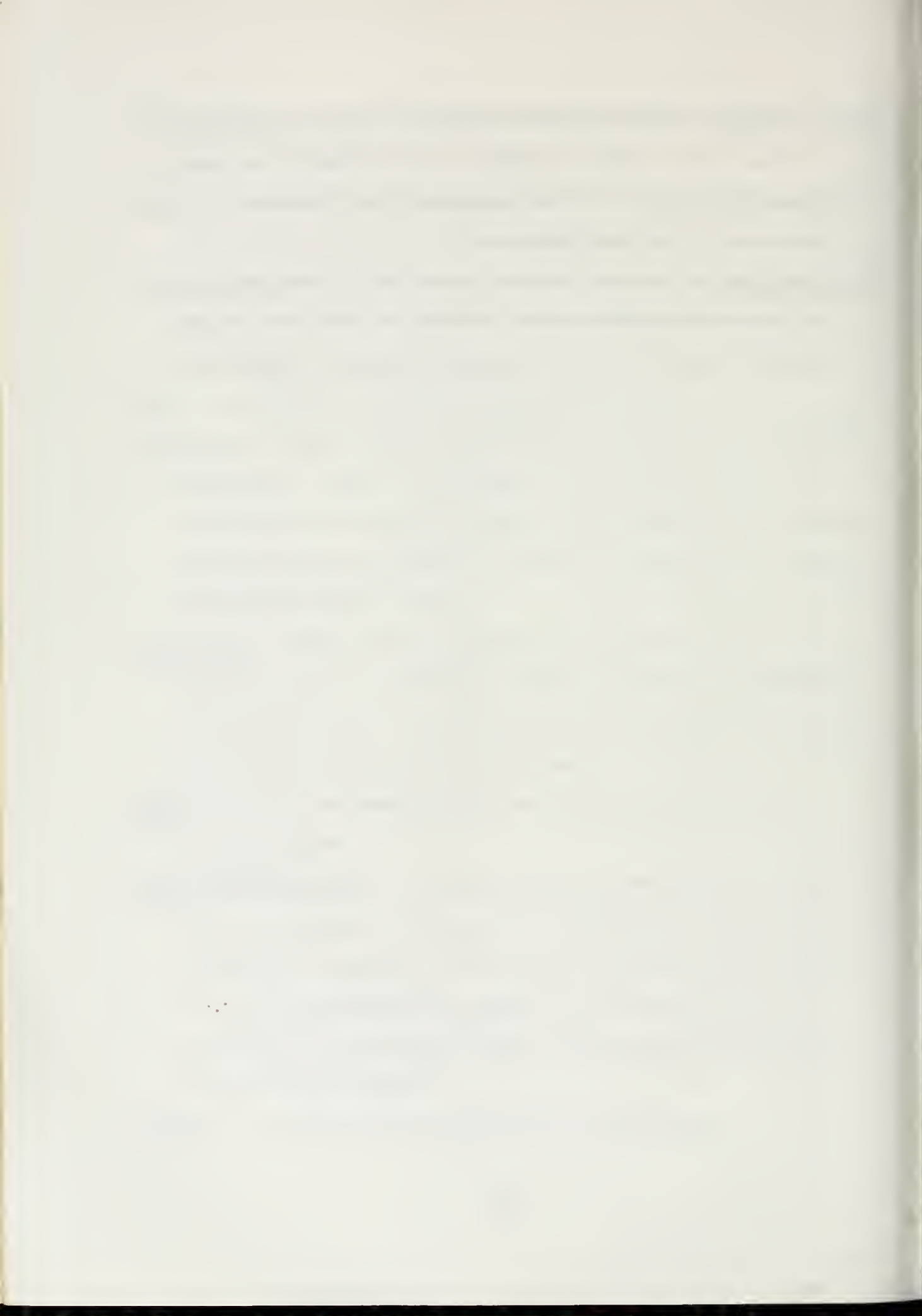
Present - Land use and water supply conditions prevailing during the 1958-1959 season.

Safe Ground Water Yield - The average annual net amount of water that could be beneficially extracted from a ground water basin over an indefinitely long period of years, under a particular set of those physical conditions affecting supply to, and disposal from, the ground water basin, without causing a net lowering of ground water levels during the period.

Seasonal - Any 12-month period other than the calendar year.

Water Utilization - Water utilization includes all employments of water by nature or man, whether consumptive or nonconsumptive, as well as irrecoverable losses of water incidental to such employment, and is synonymous with the term "water use."

Water Requirement - The water needed to provide for all beneficial uses and for all irrecoverable losses incidental to such uses. Water requirement includes the portion supplied from direct precipitation.



APPENDIX B

LAND USE IN HYDROLOGIC UNITS
AND SUBUNITS IN SAN LUIS OBISPO
AND SANTA BARBARA COUNTIES, 1959



APPENDIX B

LAND USE IN HYDROLOGIC UNITS AND SUBUNITS IN
SAN LUIS OBISPO AND SANTA BARBARA COUNTIES, 1959

In acres

Category and class of land use	Salinas Valley Hydrologic Unit				Cambria Group Hydrologic Unit			
	Paso : Robles : Subunit	Pozo : Subunit	Total : Subunit	San : Subunit	Arroyo : de la Cruz : : Subunit	Sineon : : Subunit	Santa Rosa : : Subunit	Villa : Cayucos : Subunit
WATER SERVICE AREA								
Urban and Suburban	1,020	0	1,020	0	10	20	90	140
Residential	260	a	260	a	0	10	20	10
Commercial	30	0	30	0	0	0	0	0
Industrial	2,510	100	2,610	10	10	70	110	40
Unsegregated urban and suburban area								
Subtotals	3,820	100	3,920	10	20	100	220	190
Included Nonwater-Service Area	1,840	10	1,850	a	10	30	50	70
Gross Urban and Suburban Area	5,660	110	5,770	10	30	130	270	260
Irrigated Agriculture								
Alfalfa	6,650	70	6,720	0	0	30	170	a
Pasture	4,110	50	4,160	10	70	120	180	190
Citrus and subtropical	a	0	a	0	0	0	0	0
Truck crops	420	0	420	0	a	40	0	0
Field crops	2,120	0	2,120	0	50	100	20	90
Deciduous fruits and nuts	100	0	100	0	0	10	0	0
Small grains	310	0	310	0	10	0	0	0
Vineyards	10	0	10	0	0	0	0	0
Subtotals	13,720	120	13,840	10	130	300	370	190
Fallow	360	0	360	0	0	0	a	10
Included Nonwater-Service Area	1,490	10	1,500	0	10	20	50	10
Gross Irrigated Agriculture	15,570	130	15,700	10	140	320	420	210
GROSS WATER SERVICE AREA	21,230	240	21,470	20	170	450	690	470
NONWATER-SERVICE AREA								
Nonirrigated Agriculture	218,460	490	218,950	0	0	40	630	160
Native Vegetation	267,530	1,440	268,970	180	570	380	1,540	320
Unclassified	713,740	45,040	758,780	28,260	27,070	48,990	30,610	10,680
GROSS NONWATER-SERVICE AREA	1,199,730	46,970	1,246,700	28,440	27,640	49,410	32,780	11,160
TOTALS	1,220,960	47,210	1,268,170	28,460	27,810	49,860	33,470	11,630

LAND USE IN HYDROLOGIC UNITS AND SUBUNITS IN
SAN LUIS OBISPO AND SANTA BARBARA COUNTIES, 1959
(continued)

In acres

Category and class of land use	Cambrin Group Hydrologic Unit (cont.)				San Luis Obispo Hydrologic Unit							
	Old	Toro	Total	Morro	Chorro	Los Osos	San Luis	Pismo	Coastal	Total		
	Subunit	Subunit		Subunit	Subunit	Subunit	Subunit	Subunit	Subunit			
WATER SERVICE AREA												
Urban and Suburban	40	a	300	180	320	60	1,200	290	a	2,050		
Residential	a	a	40	10	40	10	220	50	10	340		
Commercial	0	0	0	0	50	0	30	a	a	80		
Industrial	60	40	300	50	160	80	940	260	10	1,500		
Unsegregated urban and suburban area												
Subtotals	100	40	730	240	570	150	2,390	600	20	3,970		
Included Nonwater-Service Area	20	30	220	80	190	30	1,410	170	a	1,880		
Gross Urban and Suburban Area	120	70	950	320	760	180	3,800	770	20	5,850		
Irrigated Agriculture												
Alfalfa	30	30	310	0	150	50	320	240	10	770		
Pasture	50	30	740	350	100	100	920	250	0	1,720		
Citrus and subtropical	0	0	0	0	0	0	20	10	0	30		
Truck crops	0	0	40	320	80	170	280	220	0	1,070		
Field crops	20	50	330	100	170	380	510	80	0	1,240		
Deciduous fruits and nuts	0	10	20	20	0	0	0	0	0	20		
Small grains	0	0	10	0	0	0	120	0	0	120		
Vineyards	0	0	0	0	0	0	0	0	0	0		
Subtotals	100	120	1,450	790	500	700	2,170	800	10	4,970		
Fallow	10	0	30	40	50	0	260	110	0	460		
Included Nonwater-Service Area	30	10	140	70	40	80	210	110	a	510		
Gross Irrigated Agriculture	140	130	1,620	900	590	780	2,640	1,020	10	5,240		
GROSS WATER SERVICE AREA	260	200	2,570	1,220	1,350	950	6,440	1,790	30	11,790		
NONWATER-SERVICE AREA												
Nonirrigated Agriculture	260	180	1,480	170	110	1,270	3,550	2,010	0	7,110		
Native Vegetation	400	210	4,130	420	320	4,980	5,010	2,250	0	12,980		
Unclassified	14,630	9,230	183,410	15,690	28,330	10,880	29,730	24,220	27,950	136,800		
GROSS NONWATER-SERVICE AREA	15,290	9,620	189,020	16,280	28,760	17,130	38,290	28,480	27,950	156,890		
TOTALS	15,550	9,820	191,590	17,500	30,110	18,090	44,730	30,270	27,980	168,680		

LAND USE IN HYDROLOGIC UNITS AND SUBUNITS IN
SAN LUIS OBISPO AND SANTA BARBARA COUNTIES, 1959
(continued)

In acres

Category and class of land use	Arroyo Grande Hydrologic Unit										Cuyama River Valley Basin			
	Arroyo Grande		Nipomo		Mesa		Total		Nipomo		Carrizo		Cuyama	
	Subunit	Subunit	Subunit	Subunit	Subunit	Subunit	Subunit	Subunit	Subunit	Subunit	Unit	Hydrologic	Subbasin	Total
WATER SERVICE AREA														
Urban and Suburban														
Residential	820	70	10	10	0	0	900	0	0	0	0	0	80	80
Commercial	70	0	0	0	0	0	70	0	0	0	0	0	60	60
Industrial	10	20	0	0	0	0	30	0	0	0	0	0	20	20
Unsegregated urban and suburban area	650	90	30	30	0	0	770	0	0	0	0	0	460	470
Subtotals	1,550	180	40	40	0	0	1,770	0	0	0	0	0	620	630
Included Nonwater-Service Area	1,070	170	10	10	0	0	1,250	0	0	0	0	0	1,090	1,090
Gross Urban and Suburban Area	2,620	350	50	50	0	0	3,020	0	0	0	0	0	1,710	1,720
Irrigated Agriculture														
Alfalfa	200	0	0	0	0	0	200	0	0	0	0	0	6,020	6,020
Pasture	360	0	60	60	0	0	420	0	0	0	0	0	1,090	1,100
Citrus and subtropical	10	0	0	0	0	0	10	0	0	0	0	0	20	20
Truck crops	2,270	150	0	0	0	0	2,420	0	0	0	0	0	410	550
Field crops	420	10	0	0	0	0	430	0	0	0	0	0	670	730
Deciduous fruits and nuts	160	50	0	0	0	0	210	0	0	0	0	0	30	30
Small grains	0	0	0	0	0	0	0	0	0	0	0	0	100	100
Vineyards	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Subtotals	3,420	210	60	60	0	0	3,690	0	0	0	0	0	8,340	8,550
Fallow	700	10	10	10	0	0	720	0	0	0	0	0	720	770
Included Nonwater-Service Area	490	10	10	10	0	0	510	0	0	0	0	0	460	470
Gross Irrigated Agriculture	4,610	230	80	80	0	0	4,920	0	0	0	0	0	9,520	9,700
GROSS WATER SERVICE AREA	7,230	580	130	130	0	0	7,940	0	0	0	0	0	11,230	11,510
NONWATER-SERVICE AREA														
Nonirrigated Agriculture	640	340	80	80	0	0	1,060	0	0	0	0	0	10,700	10,780
Native Vegetation	4,590	14,210	1,370	1,370	70	70	20,170	0	0	0	0	0	158,900	159,900
Unclassified	82,090	1,060	0	0	0	0	83,150	0	0	0	0	0	536,250	549,350
GROSS NONWATER-SERVICE AREA	87,320	15,610	1,450	1,450	0	0	104,380	0	0	0	0	0	705,850	720,030
TOTALS	94,550	16,190	1,580	1,580	0	0	112,320	0	0	0	0	0	717,080	731,540

LAND USE IN HYDROLOGIC UNITS AND SUBUNITS IN
SAN LUIS OBISPO AND SANTA BARBARA COUNTIES, 1959
(continued)

In acres

Category and class of land use	Santa Maria River Valley										Santa Ynez River Valley Hydrologic Unit									
	San Antonio:					Creek Valley:					Santa Rita					Santa Ynez				
	Hydrologic Unit	Subunit	Subunit	Subunit	Subunit	Hydrologic Unit	Subunit	Subunit	Subunit	Subunit	Hydrologic Unit	Subunit	Subunit	Subunit	Subunit	Hydrologic Unit	Subunit	Subunit	Subunit	Subunit
	Sisquoc	Santa Maria	Total	Unit	Unit	Lompoc	Subunit	Subunit	Subunit	Subunit	Santa	Rita	Subunit	Subunit	Subunit	Santa	Ynez	Subunit	Subunit	Total
WATER SERVICE AREA																				
Urban and Suburban	20	1,680	1,700	80	780						a					170	140			1,160
Residential	a	240	240	30	70						0					60	a			150
Commercial	a	190	190	1,340	40						a					a	0			40
Industrial		1,110	1,260	220	210						160					760	70			1,400
Unsegregated urban and suburban area	150																			
Subtotals	170	3,220	3,390	1,670	1,100						160					990	210			2,750
Included Nonwater-Service Area	290	2,450	2,740	560	690						20					210	60			1,090
Gross Urban and Suburban Area	460	5,670	6,130	2,230	1,790						180					1,200	270			3,840
Irrigated Agriculture																				
Alfalfa	590	2,230	2,820	240	210						100					880	a			1,840
Pasture	400	2,430	2,830	150	340						710					1,830	120			3,810
Citrus and subtropical	0	0	0	0	0						0					0	0			0
Truck crops	230	15,260	15,490	80	4,910						390					90	0			5,420
Field crops	1,330	7,370	8,700	1,630	1,030						950					1,010	0			3,580
Deciduous fruits and nuts	0	20	20	0	140						1,080					70	180			1,470
Small grains	10	30	40	10	0						0					0	0			0
Vineyards	0	0	0	0	0						0					0	0			0
Subtotals	2,560	27,340	29,900	2,110	6,630						3,230					2,630	3,510	120		16,120
Fallow	100	5,320	5,420	0	440						80					0	a			520
Included Nonwater-Service Area	270	1,990	2,260	110	1,030						200					140	230	10		1,610
Gross Irrigated Agriculture	2,930	34,650	37,580	2,220	8,100						3,510					2,770	3,740	130		18,250
GROSS WATER SERVICE AREA	3,390	40,320	43,710	4,450	9,890						3,690					3,170	4,940	400		22,090
NONWATER-SERVICE AREA																				
Nonirrigated Agriculture	2,870	5,230	8,100	7,070	2,340						3,780					1,980	7,160	240		15,500
Native Vegetation	18,660	64,460	83,120	43,120	17,030						15,320					23,870	46,670	23,320		126,210
Unclassified	278,840	40,240	319,080	80,440	39,540						54,160					29,190	47,300	242,530		412,720
GROSS NONWATER-SERVICE AREA	300,370	109,930	410,300	130,630	58,910						73,260					55,040	101,130	266,090		554,430
TOTALS	303,760	150,250	454,010	135,080	68,800						76,950					58,210	106,070	266,490		576,520

LAND USE IN HYDROLOGIC UNITS AND SUBUNITS IN
SAN LUIS OBISPO AND SANTA BARBARA COUNTIES, 1959
(continued)

In acres

Category and class of land use	South Coast Basins Hydrologic Unit										Santa Clara River			Ventura River			San Joaquin River			Investigational Area		
	Goleta Subunit	Barbara Subunit	Montecito Subunit	Carpinteria Subunit	Barbara Countyd	Santa Clara River Hydrologic Unit	Santa Clara River Hydrologic Unit	Santa Clara River Hydrologic Unit	Santa Clara River Hydrologic Unit	Santa Clara River Hydrologic Unit	Barbara Countyd	Santa Clara River Hydrologic Unit	Santa Clara River Hydrologic Unit	Santa Clara River Hydrologic Unit	Ventura River Hydrologic Unit	Ventura River Hydrologic Unit	Ventura River Hydrologic Unit	San Joaquin River Hydrologic Unit	San Joaquin River Hydrologic Unit	San Joaquin River Hydrologic Unit	Investigational Area	Investigational Area
WATER SERVICE AREA																						
Urban and Suburban																						
Residential	850	3,890	1,300	330	6,370	30																
Commercial	210	420	40	50	720	a																
Industrial	30	60	a	0	90	10																
Unsegregated urban and suburban area	300	510	160	160	1,130	120																
Subtotals	1,390	4,880	1,500	540	8,310	160																
Included Nonwater-Service Area	1,230	1,870	600	370	4,070	190																
Gross Urban and Suburban Area	2,620	6,750	2,100	910	12,380	350																
Irrigated Agriculture																						
Alfalfa	50	0	0	0	50	60																
Pasture	90	50	a	20	160	130																
Citrus and subtropical	4,240	470	510	3,960	9,180	840																
Truck crops	270	70	20	290	650	60																
Field crops	140	0	0	40	180	20																
Deciduous fruits and nuts	420	40	0	50	510	630																
Small grains	0	0	0	0	0	30																
Vineyards	0	0	0	0	0	0																
Subtotals	5,210	630	530	4,360	10,730	1,770																
Fallow	170	10	10	30	220	0																
Included Nonwater-Service Area	390	40	30	230	690	90																
Gross Irrigated Agriculture	5,770	680	570	4,620	11,640	1,860																
GROSS WATER SERVICE AREA	8,390	7,430	2,670	5,530	24,020	2,210																
NONWATER-SERVICE AREA																						
Nonirrigated Agriculture	700	220	100	90	1,110	470																
Native Vegetation	5,460	2,590	2,040	2,920	13,010	2,750																
Unclassified	19,220	10,530	8,750	23,970	62,470	136,170																
GROSS NONWATER-SERVICE AREA	25,380	13,340	10,890	26,980	76,590	139,390																
TOTALS	33,770	20,770	13,560	32,510	100,610	141,600																

a. Less than five acres.
b. Tributary to Arroyo Grande Subunit.
c. Mipomo-Arroyo Grande Coastal Hydrologic Unit.
d. Coastal Hydrologic Unit.
e. Upper Ventura River Subunit.
f. Fillmore Subunit.

APPENDIX C

LIST OF DISTRICTS, AREAS AND UNITS
FOR WHICH INDIVIDUAL TABULATIONS
OF 1959 LAND USE ARE AVAILABLE



APPENDIX C

LIST OF DISTRICTS, AREAS, AND UNITS FOR WHICH INDIVIDUAL TABULATIONS OF 1959 LAND USE ARE AVAILABLE

Utilizing machine techniques that were developed for processing data from this survey, individual tabulations of 1959 land use can be obtained for most of the political and hydrologic subdivisions within the area of investigation. However, reasonable limitations do not permit all of these individual tabulations to be published in this report.

For those requiring more detailed information, this appendix lists all districts, areas, and units for which 1959 land use can be individually determined and tabulated by machine methods using data available in Department of Water Resources files. It should be noted that data were based on 1959 conditions, including boundaries, and have not been modified to reflect subsequent changes.

Census Tracts

County Water Districts

Feather River Project Study Areas

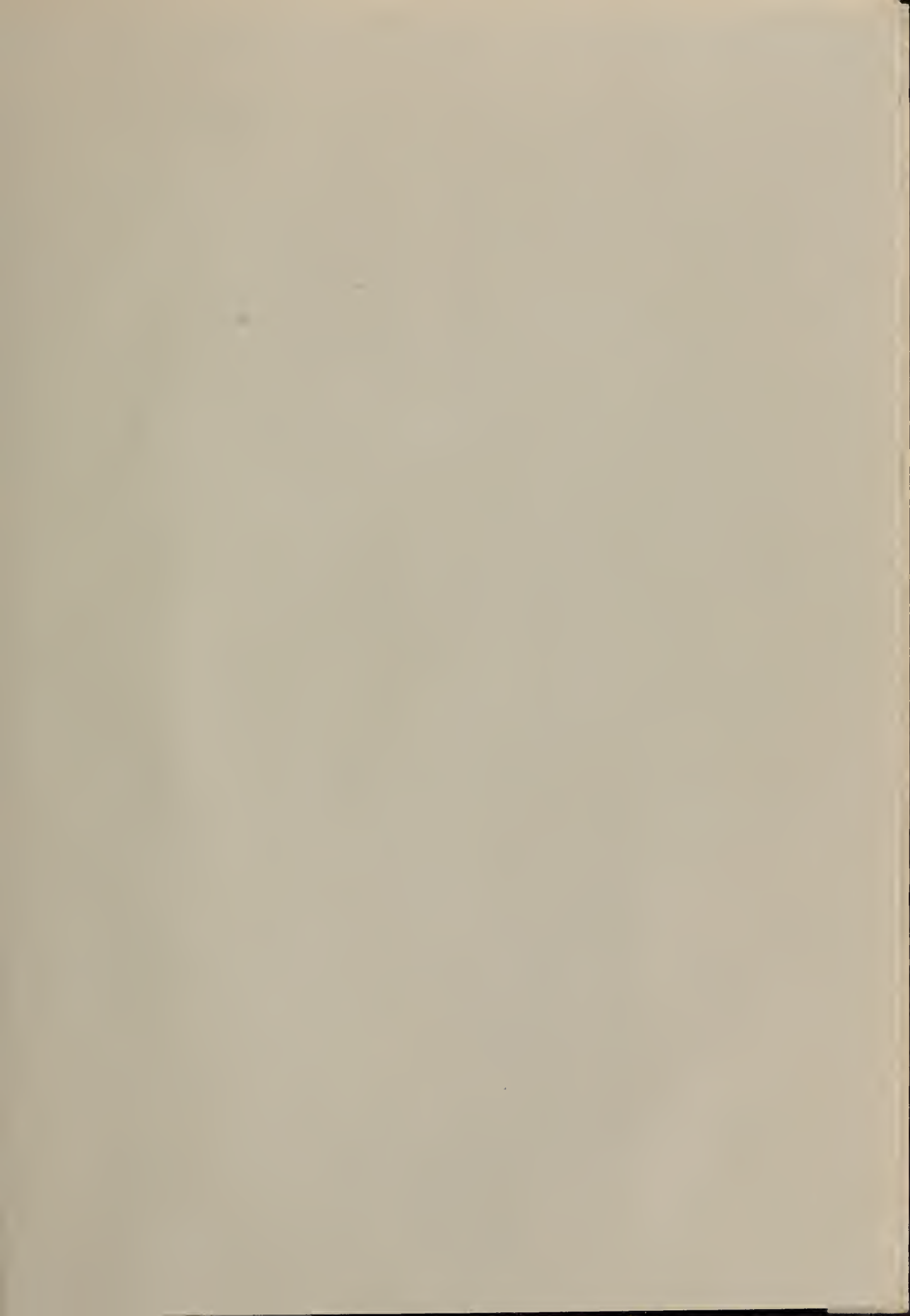
Municipalities

National Forests

Tax Areas

Water Conservation Districts





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